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Report on the individual review of the annual submission of the United Kingdom of Great Britain and Northern Ireland submitted in 2014*

* In the symbol for this document, 2014 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2014 annual submission of the United Kingdom of Great Britain and Northern Ireland, coordinated by the UNFCCC secretariat, in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines). The review took place from 1 to 6 September 2014 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Gebru Jember Endalew (Ethiopia) and Mr. Tomas Gustafsson (Sweden); energy – Mr. Darío Gómez (Argentina), Mr. James Aidan Kennedy (Ireland) and Mr. Michael Strogies (Germany); industrial processes and solvent and other product use – Ms. Elsa Hatanaka (Japan), Mr. Thapelo Clifford Mohale Letete (South Africa) and Mr. Andrew Neal (New Zealand); agriculture – Mr. Kingsley Kwako Amoako (Ghana) and Mr. Amnat Chidthaisong (Thailand); land use, land-use change and forestry (LULUCF) – Mr. George Mitri (Lebanon), Mr. Lucio Santos (Colombia) and Mr. Harry Vreuls (Netherlands); and waste – Mr. Cristobal Felix Diaz Morejon (Cuba) and Mr. Takefumi Oda (Japan). Mr. Gómez and Ms. Hatanaka were the lead reviewers. The review was coordinated by Ms. Kyoko Miwa (UNFCCC secretariat).

2. In accordance with the Article 8 review guidelines, a draft version of this report was sent to the Government of the United Kingdom, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2013 annual review report of the United Kingdom was published after 15 April 2014, which may have affected the Party's ability to implement recommendations and encouragements made in the previous review report.

3. All recommendations and encouragements included in this report are based on the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines. The ERT has not taken into account the fact that Parties will prepare the submissions due by 15 April 2015 using the revised "Guidelines for the preparation of national communications by Parties include in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" (hereinafter referred to as the UNFCCC Annex I inventory reporting guidelines) adopted through decision 24/CP.19. Therefore, when preparing the 2015 annual submissions, Parties should evaluate the implementation of the recommendations and encouragements in this report, in the context of those guidelines.

4. In 2012, the main greenhouse gas (GHG) emitted by the United Kingdom was carbon dioxide (CO_2), accounting for 82.4 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (9.0 per cent) and nitrous oxide (N_2O) (6.0 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.5 per cent of the overall GHG emissions in the country. The energy sector accounted for 82.8 per cent of total GHG emissions, followed by the agriculture sector (8.9 per cent), the industrial processes sector (4.3 per cent) and the waste sector (4.0 per cent). In the solvent and other product use sector, not occurring ("NO") was reported for some categories and not estimated ("NE") was reported for others. Total GHG emissions amounted to 586,357.13 Gg CO_2 eq and decreased by

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

25.5 per cent between the base year[2] and 2012. The ERT concluded that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

5. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively.

6. Information to be included in the compilation and accounting database can be found in annex I to this report.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from sources included in Annex A to the Kyoto Protocol only.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by gas, base year[a] to 2012

			Gg CO_2 eq								Change (%)
		Greenhouse gas	Base year	1990	1995	2008	2009	2010	2011	2012	Base year–2012
Annex A sources[b]		CO_2	591 499.32	591 499.32	553 701.86	536 733.75	487 442.44	504 997.52	464 036.07	483 423.63	–18.3
		CH_4	109 058.78	109 058.78	103 221.12	62 805.30	59 409.09	56 698.02	54 817.73	52 784.11	–51.6
		N_2O	69 081.16	69 081.16	58 804.92	38 353.27	36 189.30	37 089.08	35 709.48	35 410.58	–48.7
		HFCs	15 326.16	11 384.05	15 326.16	12 777.28	13 182.74	13 564.87	13 825.24	13 988.67	–8.7
		PFCs	461.81	1 401.60	461.81	203.93	145.03	220.62	325.35	207.98	–55.0
		SF_6	1 200.93	987.40	1 200.93	584.90	561.31	647.77	559.33	542.16	–54.9
KP-LULUCF	Article 3.3[c]	CO_2				–1 153.82	–1 303.69	–1 554.89	–1 737.89	–1 872.53	
		CH_4				34.97	35.89	32.30	32.10	34.11	
		N_2O				5.57	5.27	4.60	4.87	7.13	
	Article 3.4[d]	CO_2	NA			–15 701.81	–15 573.67	–15 411.41	–15 133.38	–14 626.06	NA
		CH_4	NA			5.64	4.91	2.80	3.27	13.62	NA
		N_2O	NA			43.81	43.17	41.32	41.56	49.96	NA

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] The base year for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include the emissions from deforestation that were included in the United Kingdom's initial report under the Kyoto Protocol for the base year and subsequently used for the calculation of the assigned amount.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2012

			Gg CO_2 eq							Change (%)	
	Sector		Base year	1990	1995	2008	2009	2010	2011	2012	Base year–2012
Annex A sources	Energy		611 753.07	611 753.07	568 040.98	535 140.92	489 783.58	506 338.92	465 407.43	485 541.80	–20.6
	Industrial processes		57 462.37	54 246.52	46 433.89	30 447.65	24 994.43	26 551.05	25 389.04	24 973.31	–56.5
	Solvent and other product use		NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NA
	Agriculture		65 509.24	65 509.24	64 378.40	53 183.65	52 324.39	53 054.25	52 721.69	52 125.82	–20.4
	Waste		51 903.47	51 903.47	53 863.53	32 686.20	29 827.51	27 273.67	25 755.03	23 716.21	–54.3
	LULUCF		NA	1 878.97	1 488.42	–6 856.42	–6 935.97	–7 248.63	–7 485.23	–6 978.39	NA
	Total (with LULUCF)		**NA**	**785 291.27**	**734 205.22**	**644 602.00**	**589 993.95**	**605 969.26**	**561 787.97**	**579 378.74**	**NA**
	Total (without LULUCF)		**786 628.16**	**783 412.30**	**732 716.80**	**651 458.42**	**596 929.92**	**613 217.89**	**569 273.20**	**586 357.13**	**–25.5**
	Other[b]		NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation				–2 211.42	–2 395.86	–2 584.15	–2 766.14	–2 910.92	
		Deforestation				1 098.15	1 133.33	1 066.16	1 065.22	1 079.64	
		Total (3.3)				**–1 113.27**	**–1 262.53**	**–1 517.99**	**–1 700.92**	**–1 831.28**	
	Article 3.4[d]	Forest management				–15 652.36	–15 525.59	–15 367.29	–15 088.55	–14 562.49	
		Cropland management	NA			NA	NA	NA	NA	NA	NA
		Grazing land management	NA			NA	NA	NA	NA	NA	NA
		Revegetation	NA			NA	NA	NA	NA	NA	NA
		Total (3.4)	**NA**			**–15 652.36**	**–15 525.59**	**–15 367.29**	**–15 088.55**	**–14 562.49**	**NA**

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable, NE = not estimated, NO = not occurring.

[a] The base year for Annex A sources is the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

7. The 2014 annual submission was submitted on 15 April 2014; it contains a complete set of common reporting format (CRF) tables for the period 1990–2012 and an NIR. The United Kingdom also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2014. The annual submission was submitted in accordance with decision 15/CMP.1.

8. The United Kingdom submitted revised emission estimates on 16 October 2014 in response to the list of potential problems and further questions raised by the ERT. The values used in this report are those submitted by the United Kingdom on 16 October 2014.

9. The list of other materials used during the review is provided in annex II to this report.

2. Questions of implementation raised in the 2013 annual review report

10. The ERT noted that no questions of implementation have been raised in the 2013 annual review report.

3. Adjustments applied in a previous annual review report

11. The ERT noted that, consistent with paragraph 11 of decision 20/CMP.1, the United Kingdom has submitted a revised estimate for a category in its inventory to which an adjustment was previously applied. Specifically, the United Kingdom submitted revised estimates for CH_4 from solid waste disposal on land for 1990–2012.[3] The ERT has reviewed the revised estimates and accepted them (see paras. 88–90 below). The ERT concludes that the revised estimates for CH_4 from solid waste disposal on land for 1990–2012 shall replace the adjusted estimate in the compilation and accounting database.

4. Overall assessment of the inventory

12. Table 3 contains the ERT's overall assessment of the annual submission of the United Kingdom. For recommendations for improvements for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

Issue	*Expert review team assessment*	*General findings and recommendations*
The ERT's findings on completeness		

[3] For a discussion of the original adjustment case please refer to document FCCC/ARR/2013/GBR, paragraphs 121–133.

Issue	*Expert review team assessment*	*General findings and recommendations*
Annex A sources[a]	Complete	Mandatory: None
		Non-mandatory: CO_2, CH_4 and N_2O emissions from multilateral operations; N_2O emissions from glass production, asphalt production and fletton brick production under other (mineral products); N_2O emissions from ammonia production; CH_4 emissions from aluminium production; CO_2 emissions from food and drink; potential emissions of HFCs and PFCs from import/export; CO_2 emissions from paint application; CO_2 and N_2O emissions from degreasing and dry cleaning; CO_2 emissions from chemical products, manufacture and processing; CO_2 and N_2O emissions from other (solvent and other product use); CH_4 indirect emissions from agricultural soils; CO_2 emissions from managed waste disposal on land; N_2O emissions from domestic and commercial wastewater (sludge); and CO_2 and N_2O emissions (accidental fires) and CH_4 emissions (chemical) from other (waste incineration)
Land use, land-use change and forestry[a]	Not complete	Mandatory: Carbon stock changes in living biomass in overseas territories for forest land converted to wetlands (see para. 84 below)
		Non-mandatory: Carbon stock changes in living biomass and dead organic matter for on-site emissions from peat production (wetlands remaining wetlands); CH_4 emissions from drainage of soils and wetlands; and CH_4 and N_2O emissions from harvested wood products
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency		
Transparency of recalculations	Sufficiently transparent	Please see paragraphs 27, 29 and 64 below for category-specific findings
Time-series consistency	Sufficiently consistent	Please see paragraphs 47 and 55 below for category-specific findings
The ERT's findings on QA/QC procedures	Sufficient	The Party has elaborated a QA/QC plan and has implemented tier 1 QA/QC procedures in accordance with that plan
		Please see paragraph 13 below and paragraphs 37, 57, 64 and 87 below for cross-cutting and category-specific recommendations, respectively

Issue	*Expert review team assessment*	*General findings and recommendations*
The ERT's findings on transparency	Not sufficiently transparent	Please see paragraph 15 below and paragraphs 31, 38, 39, 44, 51, 54, 59, 67, 74, 76, 83, 91, 92, 93, 100, 101 and 103 below for cross-cutting and category-specific recommendations, respectively

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, ERT = expert review team, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

13. The ERT noted several inconsistencies between the notation keys used in the NIR and those reported in CRF table summary 3. For example, in the CRF table, the notation key "OTH" ("other") was used for emission factors (EFs) for CH_4 emissions from manufacturing industries and construction and from other sectors under the energy sector, whereas no corresponding information was provided in the NIR. In response to a question raised by the ERT during the review, the United Kingdom explained that it is part of its quality assurance/quality control (QA/QC) plan to improve its QC procedures by developing new software to upload all emission data and meta data (e.g. notation keys) from its internal database to the new CRF reporting software. The ERT commends the United Kingdom for its efforts to improve the QA/QC system and recommends that the United Kingdom describe any changes in the QA/QC procedures in its NIR.

14. The ERT noted that in the NIR (p. 48), the National Inventory Steering Committee (NISC) makes a pre-submission review. However, the ERT could not find any information related to the outcome of the review. In response to a question raised by the ERT during the review, the United Kingdom provided additional information (meeting minutes) describing that no changes occurred as a result of the review. The ERT commends the United Kingdom for the well-documented information on the review and recommends that the United Kingdom provides a short summary of the pre-submission review outcome in the NIR.

15. The ERT considers that the Party's 2014 annual submission is not sufficiently transparent. Specifically, the ERT noted multiple issues for the reported information for the energy, agriculture and LULUCF sectors and for the Party's reporting of KP-LULUCF, for which assumptions and methodologies used were not properly explained to facilitate replication and assessment of the inventory by the ERT. For example, in the agriculture sector, justifications were not provided for the use of a tier 1 methodology for mature breeding sheep and for the related reduction factor for producing lambs (see para. 66 below). In response to questions raised by the ERT during the review, the United Kingdom provided additional substantial information that clarified many of the issues. The ERT commends the United Kingdom for its efforts to enhance the transparency of the inventory during the review and recommends that the United Kingdom improve the transparency of the NIR by including sufficient information in the annual submission (e.g. based on the supporting material provided during the review). In addition, the ERT encourages the United Kingdom to coordinate the improvement of information in the NIR to ensure the further harmonization of sectoral information.

5. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

16. The NIR and additional information provided by the Party during the review described the national system for the preparation of the inventory. As indicated by the Party in its NIR, there were no changes to the inventory planning process. The description of the inventory planning process, as contained in the report of the individual review of the annual submission of the United Kingdom submitted in 2013,[4] remains relevant.

Inventory preparation

17. Table 4 contains the ERT's assessment of the United Kingdom's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by the United Kingdom

Issue	*Expert review team assessment*	*ERT findings and recommendations*
Key category analysis		
Was the key category analysis performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	No	Level and trend analysis performed, including and excluding LULUCF See paragraphs 18 and 52 below
Approach followed?	Tier 2	
Were additional key categories identified using a qualitative approach?	Yes	Cement production (industrial processes sector)
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Partly yes	See paragraph 19 below
Assessment of uncertainty analysis		
Approach followed?	Both tier 1 and tier 2	

[4] FCCC/ARR/2013/GBR, paragraph 10.

Issue	*Expert review team assessment*	*ERT findings and recommendations*
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	The tier 2 analysis was only carried out including LULUCF; therefore, the values presented below reflect a tier 2 uncertainty analysis (including LULUCF) and a tier 1 uncertainty analysis (excluding LULUCF) See paragraph 20 below
Quantitative uncertainty (including LULUCF)	Level = 5% Trend = –3% to +2%	
Quantitative uncertainty (excluding LULUCF)	Level = 12.3% Trend = 2.6%	

Abbreviations: IPCC good practice guidance = the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, LULUCF = land use, land-use change and forestry

18. In annex 1 of its 2014 NIR, the United Kingdom describes the method applied for the key category analysis in detail. As was identified by the previous ERT, the aggregation level of the Party's key category analysis in several cases is not in line with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). The IPCC good practice guidance proposes the aggregation of categories where the same EF, based on common assumptions, is used. For example, the United Kingdom uses the aggregation level CH_4 emissions from enteric fermentation, despite the fact that separate EFs are applied for different animal types. Also, for emissions of fluorinated gases (F-gases) from industrial processes, the United Kingdom uses aggregated emission categories (by F-gas for the whole sector) in its key category analysis, even though information on emissions is provided by subcategory in the CRF tables and the NIR (see also para. 52 below). The Party has indicated in its NIR (p. 597) that it is working to improve the method for its key category analysis in order to provide a more disaggregated key category analysis. The United Kingdom states that the method is still under development, to be included in complete format for the 2015 annual submission. The ERT commends the United Kingdom for its efforts and reiterates the recommendation made in the previous report that the United Kingdom perform a key category analysis following the IPCC good practice guidance at an aggregation level where individual methodologies and EFs are used.

19. The United Kingdom describes in its NIR that it uses the key category analysis to prioritize inventory improvements. As a result, table 1.5 of the NIR contains a list of high-priority improvement programme items for the 2014 cycle to address inventory uncertainties. The ERT considers that, in most cases, the Party's prioritization at the stage of inventory preparation has led to actual improvements of the United Kingdom inventory over time. However, the ERT noted that there have been several reiterated recommendations made in previous review reports related to the agriculture sector that have not been addressed accordingly. In particular, recommendations related to improved documentation on national feeding conditions for non-dairy cattle (see para. 65 below) and justification for the use of a tier 1 methodology for mature breeding sheep and reduction

factor for producing lambs (see para. 66 below). Therefore, the ERT strongly recommends that the United Kingdom improve its inventory preparation in terms of prioritizing inventory improvements using the key category analysis.

20. In its 2014 NIR, the United Kingdom states that several improvements of the elements that underpin its tier 2 uncertainty analysis using a Monte Carlo model were made since the 2013 annual submission. For example, new country-specific information on activity data (AD), EFs or emissions were incorporated in the model. As a result, the quantitative uncertainty including LULUCF was reduced from 17 per cent for 2011 (2013 annual submission) to 5 per cent for 2012 (2014 annual submission), mainly owing to changes in the probability density function for the category agricultural soils under the agriculture sector, using information based on recent United Kingdom research. The ERT commends the United Kingdom for its efforts to increase the accuracy of its reporting.

Inventory management

21. There were no changes to the inventory management process carried out by the Party for the 2014 annual submission, as indicated by the Party in its NIR. The description of the inventory management process, as contained in the report of the individual review of the annual submission of the United Kingdom submitted in 2013,[5] remains relevant.

22. Previous review reports have recommended that the United Kingdom include information in its NIR on the role that Rothamsted Research and United Kingdom Centre for Ecology and Hydrology (CEH) have with respect to archiving. The ERT noted that the United Kingdom has provided information in the 2014 NIR, namely that Rothamsted Research and CEH back up the data on a daily basis on the network storage system and archive the data after finalization of the inventory. The ERT commends the Party for this improvement to the transparency of its NIR.

6. Follow-up to previous reviews

23. The ERT noted that several of the outstanding recommendations made in previous review reports have been addressed by the United Kingdom in its 2014 annual submission. The ERT has identified major improvements in the 2014 annual submission that have been implemented largely in response to these recommendations and the ERT commends the United Kingdom for its continued efforts to improve its inventory. For example, improvements include:

(a) Enhanced transparency in the energy, industrial processes and waste sectors (e.g. owing to improved information on: the provision of EFs on an energy basis submitted alongside the NIR and the classification of non-energy use of fuel in the energy sector; methods and data sources for N_2O from nitric acid production in the NIR for the industrial processes sector; and the methodology used to derive EFs for CH_4 from wastewater handling in the waste sector) (see paras. 28, 35, 53 and 92);

(b) Enhanced completeness of the inventory by including estimates of forest planted prior to 1921 in the LULUCF sector (see para. 71);

(c) Enhanced accuracy of the emission estimates (owing to the implementation of a more detailed forest carbon accounting model (CARBINE) and improved information regarding the management of forest areas in the LULUCF sector) (see paras. 74 and 75).

24. In previous review reports, the United Kingdom had not provided sufficient information regarding paragraph 4 of the annex to decision 15/CMP.1, which states that "each Party included in Annex I shall describe in its annual inventory any steps taken to

[5] FCCC/ARR/2013/GBR, paragraph 13.

improve the estimates in areas that were previously adjusted". The ERT noted that, in its 2014 annual submission, the United Kingdom states that the revision of the method for estimating CH_4 and N_2O emissions from road transportation was due to the adjustment made during the review of the 2012 annual submission. The ERT welcomes the improvements, which bring the submission in line with the reporting requirements.

25. Recommendations from previous reviews that have not yet been implemented, as well as issues that the ERT identified during the 2014 annual review, are discussed in the relevant sectoral chapters of the report.

B. Energy

1. Sector overview

26. The energy sector is the main sector in the GHG inventory of the United Kingdom. In 2012, emissions from the energy sector amounted to 485,541.80 Gg CO_2 eq, or 82.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 20.6 per cent. The key drivers for the fall in emissions are the switch from solid fuels to gaseous fuels;[6] the reduced energy intensity of the economy (i.e. the switch from industrial production to services); and the economic crisis of recent years. Within the sector, 39.5 per cent of the emissions were from energy industries, followed by 23.8 per cent from transport, 20.4 per cent from other sectors and 13.5 per cent from manufacturing industries and construction. Fugitive emissions from fuels accounted for 2.3 per cent and other (fuel combustion) accounted for 0.5 per cent.

27. The United Kingdom has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by the United Kingdom between the 2013 and 2014 annual submissions were in the following categories: CO_2 from manufacturing industries and construction and CO_2 from other sectors. The recalculations were made following changes in the AD and EFs. Compared with the 2013 annual submission, the recalculations resulted in a decrease of emissions in the energy sector of 570.59 Gg CO_2 eq (0.1 per cent), and a decrease in total national emissions of 0.1 per cent. Although the recalculations were adequately explained in the NIR, the ERT noted that the description on changes in underlying national energy data taken from DUKES (the Digest of UK Energy Statistics) could be improved to increase the transparency. For example, according to the explanation given in a document on the DUKES website, data in DUKES were revised because of a reallocation of gas use between the industrial and services sectors. If a summary of such underlying reasons for revisions to DUKES is available online, a link to this could be provided. The ERT encourages the Party to provide in its NIR more detailed explanations regarding revisions to national statistics in future submissions.

28. As noted in previous review reports, the units used by the United Kingdom for the AD and EFs are different from those used by most other reporting Parties (e.g. Mt or Mth, not TJ for carbon EFs). The ERT acknowledges that improvements have been made in recent annual submissions, such as the provision of EFs on an energy basis in an Excel file submitted alongside the NIR[7] and referenced below the tables of EFs in annex 3 to the NIR. In response to questions raised by the ERT during the review, the Party stated that a project is currently ongoing to review the energy chapter and associated annex in the United Kingdom's NIR and to propose a new structure. The Party also stated that it will ensure that

[6] It should be noted that in 2012 there was a notable reversal of this trend, with solid fuel use increasing, while gaseous fuel use decreased.

[7] Spreadsheet file entitled "energy_background_data_uk_2014.xls" submitted with the NIR.

this point is noted and that tables are presented in more comparable units. The ERT commends the United Kingdom for the above effort, and reiterates the recommendations made in previous review reports that the United Kingdom complete the improvements regarding the use of comparable units.

29. The ERT noted that summary tables showing the change in emissions owing to recalculations by category (e.g. energy industries) and by gas are provided in chapter 10 of the NIR. In addition, summary tables showing category-specific recalculations for both AD and EFs are provided in chapter 3 of the NIR for each subcategory (e.g. public electricity and heat production) within the energy sector. These provide a useful overview of recalculations. However, as the data in the tables in chapter 3 are shown in different units (e.g. Mt, Mth; kt/Mth, kt/Mt as opposed to TJ and t/TJ), when multiple recalculations have occurred, it can be difficult to ascertain which specific recalculations had the greatest impact on emissions. Transparency in this regard could be further enhanced by providing an additional table in chapter 3 of the NIR summarizing the change in emissions owing to recalculations at a subcategory level. The ERT encourages the Party to consider providing such a table in its annual submission to improve transparency.

2. Reference and sectoral approaches

30. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 31–36 below.

Table 5

Review of reference and sectoral approaches

Issue	*Expert review team assessment*	*Paragraph cross-reference*
Difference between the reference approach and the sectoral approach	Energy consumption: –139.16 PJ, –2.08% CO_2 emissions: –3,274.00 Gg CO_2, –0.70%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	See paragraph 32 below
Are differences with international statistics adequately explained?	Yes	See paragraph 34 below
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	See paragraph 34 below
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	See paragraph 36 below

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

31. Although the overall difference between the reference approach and the sectoral approach is less than 2 per cent for the entire time series (1990–2012), the ERT noted that larger differences occur for the liquid and solid fuels. For solid fuels, the differences between the two approaches range from –0.9 to 7.3 per cent for energy consumption and from –4.2 to 1.5 per cent for CO_2 emissions, while for liquid fuels, the differences range from –6.1 to 0.5 per cent for energy consumption (–5.5 per cent in 2012) and from –3.4 to 4.6 per cent for CO_2 emissions (–2.4 per cent in 2012). While the ERT commends the Party for improving the information given in the NIR regarding the differences between the two approaches, it notes that the larger differences for liquid and solid fuels are not adequately explained. In response to questions raised by the ERT during the review, the Party provided information regarding the possible sources of these differences (see para. 32 below). The ERT recommends that the Party include a summary of this information in the NIR, so that the differences between the approaches for liquid and solid fuels are more transparently explained.

32. During the review week, it was established that some of the differences between the respective approaches for solid fuels could be attributed to the following issues:

(a) Data on production of coking coal and anthracite are aggregated with bituminous coal production in the reference approach, but are treated separately in the sectoral approach. The Party believes that this could lead to the reference approach emissions being higher than the sectoral approach emissions in some years, but lower in other years. The Party stated that further investigation would be required to quantify the impact of this issue and that it would explore the possibility of disaggregating coal production data in the reference approach. The ERT recommends that the United Kingdom investigate the possibility of using disaggregated coal data in the reference approach, as this could reduce differences between the two approaches and improve the accuracy of the comparison;

(b) Data on imports of coke oven/gas coke used in the reference approach excluded imports of coke oven coke in error. The Party stated that this will be corrected for the 2015 submission and that additional checks will be added to ensure that all imports are accounted for. The ERT recommends that the Party implement these checks to ensure that all imports are correctly accounted for;

(c) An incorrect EF was used for calculating emissions from brown coal briquettes (BKB)/patent fuel in the reference approach. However, because of the comparatively small quantities involved, this is thought to have had a marginal effect on the calculations. The ERT recommends that the Party review the EFs used to ensure that the correct values are used in the annual submission.

33. The previous ERT noted in its report that the values used by the Party for fraction of carbon oxidized in the reference approach were mainly the same as the IPCC default fractions, with the exception of anthracite, peat, BKB/patent fuel, and coke oven/gas coke, and strongly recommended that the Party review these fractions and report them accordingly in the NIR. Although a review was not carried out in time for the 2014 annual submission, the Party informed the ERT that it intends to use the IPCC defaults for the 2015 annual submission. The ERT recommends that the Party apply the relevant IPCC defaults in its annual submission.

International bunker fuels

34. The ERT noted that total fuel consumption (residual fuel oil and gas/diesel oil) in international marine bunkers is comparable to that reported to the International Energy Agency (IEA) from 2008–2012, but that differences occur in preceding years. In response to questions raised by the ERT during the review, the Party explained that a new method

for splitting consumption between domestic navigation and international marine bunkers was developed in 2007 and that, for consistency, this new method was extrapolated backwards in calculating data provided in the CRF tables, but not in data provided to the IEA. As a result, differences occur between the respective datasets before 2008. The ERT encourages the United Kingdom to explore the potential of also extrapolating the new method backwards in submissions to the IEA, so that the data reported to the UNFCCC and the IEA are comparable.

Feedstocks and non-energy use of fuels

35. In response to recommendations made in previous review reports, the United Kingdom commissioned a study to review the classification of non-energy fuel use. The results of this study were incorporated in the 2014 NIR. The ERT commends the United Kingdom for making those improvements. In particular, the following improvements were made:

(a) A summary table of identified non-energy use, by fuel, was included in section 3.2.3 of the NIR;

(b) Details were provided regarding the major identified non-energy uses of petroleum coke;

(c) It was confirmed through consultation with producers and refiners of coal tar in the United Kingdom that all coal tar is collected, refined and processed into products that are not used as fuel;

(d) It was confirmed through industry consultation that gas/diesel oil is delivered from refineries in the United Kingdom to a small number of petrochemical production facilities for use as feedstock, and that it is not used in the manufacture of explosives.

36. As the United Kingdom reports all emissions from non-energy use of natural gas under the industrial processes sector, the fraction of carbon stored for natural gas has been reported as 1.0 in CRF table1.A(d). This is in line with the suggestion of a previous ERT. However, the corresponding quantity of carbon stored in non-energy use of natural gas reported by the Party (in column E of CRF table1.A(d)) excludes the amount emitted in the industrial processes sector. This is incorrect, because excluding the quantity of carbon emitted in the industrial processes sector from the amount of carbon stored in the energy sector implies that the fraction of carbon stored is less than 1.0. As a result of this mismatch between the reported fraction of carbon stored and the quantity of carbon stored, the implied emission factor (IEF) for non-energy use of natural gas appears artificially low (5.2 t C/TJ in 2012, compared with the expected value of 15.4 t C/TJ). To avoid this, the ERT recommends that the Party include the carbon content of emissions in the industrial processes sector in the amount of carbon stored in non-energy use of fuels reported in the energy sector in column E of CRF table1.A(d).

3. Key categories

Stationary combustion: solid, liquid and gaseous fuels – CO_2, CH_4 and N_2O[8]

37. The ERT noted that the IEF for solid fuels in public electricity and heat production decreased by between 3 per cent and 5 per cent from 2008 onwards compared with the previous annual submission. The IEF for CO_2 for 2011 in the 2014 annual submission is 87.28 t/TJ, while it was 91.14 t/TJ in the 2013 submission. Similarly, the respective values for the CH_4 and N_2O IEFs in the 2014 submission are 0.78 and 2.46 kg/TJ, compared with

[8] CH_4 and N_2O emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

0.82 and 2.57 kg/TJ in the 2013 submission. The ERT noted, however, that no explanation for this had been provided in the NIR. In response to a question raised by the ERT during the review, the Party explained that the IEF appeared to have decreased because of the incorrect updating of calorific values, but that this did not affect the mass-based AD or the emissions calculated using mass-based EFs. The Party stated that this will be corrected for the next annual submission and that, because of the integration of calorific values into some of the QA/QC procedures, these errors will become less likely in future annual submissions, and also stated that any changes will be better documented. The ERT notes that similar errors have occurred in previous annual submissions, and recommends that the United Kingdom implement its planned improvements to avoid errors in future CRF tables. In addition, the ERT recommends that the Party provide an update on the status of QA/QC improvements in its annual submission.

38. The ERT noted that the CO_2 IEFs for solid fuels for the following subcategories were lower than the IPCC default range (94.6–106.7 t/TJ), and in some cases, are among the lowest reported. For non-ferrous metals (manufacturing industries and construction), the United Kingdom reported 90.5–92.5 t/TJ across the time series, and similarly reported: 90.5–92.5 t/TJ for food, beverages and tobacco (manufacturing industries and construction); 87.5–99.4 t/TJ for other (manufacturing industries and construction); 86.4–86.6 t/TJ for residential (other sectors); and 87.9–88.2 t/TJ for agriculture, forestry and fishing (other sector). The ERT identified that this was mainly due to the use of lower than expected EFs for bituminous coal. In response to questions raised by the ERT during the review, the Party cited the *Review of Carbon Emission Factors of the UK Greenhouse Gas Inventory*,[9] which explains that mass-based EFs were provided by British Coal in 1989 and that these factors have been extrapolated through time, based on gross calorific values. In response to follow-up questions, the Party explained that bituminous coal produced in the United Kingdom has a low carbon content, that the original EFs continue to be representative of coal consumption in these subcategories and that the EFs are comparable with the tier 3 country-specific EFs that have been reported by United Kingdom plants under the European Union Emissions Trading System (EU ETS). The ERT subsequently reviewed the EFs and found that, although they are below the defaults provided in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), they are within the 95 per cent confidence interval for bituminous coal EFs. Therefore, the ERT is of the view that use of these EFs may be justified. However, the ERT considers that the justification for their use is not sufficiently transparent in the text of the NIR, nor in the document referenced above. The ERT therefore recommends that the United Kingdom improve the text of the relevant sections of the NIR to better explain the reasons for the low EFs and justify its extrapolation of these EFs over the entire time series.

39. The previous ERT noted that the oxidation factors reported for coal – other, coal – domestic, coke – power, coke – other and anthracite – domestic were lower than the default value (0.98) specified in the Revised 1996 IPCC Guidelines and recommended that the Party either justify the use of these factors or use the IPCC defaults. The current ERT noted that the same oxidation factors were also reported in this annual submission, but justification was not provided in the NIR. In response to a question raised by the ERT during the review, the Party explained that the EFs which were provided by British Coal in 1989 already contained a correction for carbon unoxidized, although it is not clear precisely what this correction was. As such, the oxidation factors reported are not actually used, rather they are just calculated (as the difference between the 1989 EFs which account for

[9] DEFRA. 2004. *Review of Carbon Emission Factors in the UK Greenhouse Gas Inventory*. Available at <http://naei.defra.gov.uk/reports/reports?report_id=417>.

carbon unoxidized and older EFs which do not) and provided for information purposes. While the ERT does not consider this an accurate method of calculating oxidation factors (as it assumes that there were no other differences between the EFs), the inaccuracy is not a significant issue because these factors were not used in the emissions calculations. However, the ERT is of the view that the text relating to these factors in the NIR is not sufficiently transparent, and recommends that the Party improve the documentation of these country-specific EFs and oxidation factors, including any corrections done, in its annual submission. In addition, should the Party revise any of the EFs to discount carbon unoxidized, the ERT recommends that these revisions be clearly documented in the NIR.

40. The ERT noted that the United Kingdom had recalculated emissions of CH_4 and N_2O from combustion of coke oven gas and blast furnace gas under the categories energy industries, manufacturing industries and construction, as well as from the solid fuels transformation under fugitive emissions from fuels.[10] Recalculations occurred because the Party had replaced EFs from the *EMEP/EEA Emission Inventory Guidebook*[11] with EFs from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines), citing a lack of default EFs in the Revised 1996 IPCC Guidelines. While the ERT agrees that fuel-specific EFs are not provided in the Revised 1996 IPCC Guidelines, default EFs for coal (including coal products) are provided. As Parties have agreed to use the Revised 1996 IPCC Guidelines for the first commitment period of the Kyoto Protocol, the ERT is of the view that the tier 1 default EFs are those of the Revised 1996 IPPC Guidelines and that switching to the 2006 IPCC Guidelines without providing information supporting the claim that fuel-specific EFs are not provided in the Revised 1996 IPCC guidelines is not in line with the IPCC good practice guidance, and therefore the ERT was of the view that the United Kingdom was potentially underestimating these emissions.

41. Therefore, in the list of potential problems and further questions raised by the ERT during the review, the ERT recommended that the United Kingdom either provide technology-based information to justify that emissions of CH_4 and N_2O arising from the combustion of blast furnace gas and coke oven gas using current technologies and practices in the United Kingdom are best represented by the tier 1 default EFs reported in the 2006 IPCC Guidelines, or provide revised emission estimates based on either the previous EFs from the EMEP/EEA Guidebook or the tier 1 default EFs reported in the Revised 1996 IPCC Guidelines.

42. In response to the list of potential problems and further questions raised by the ERT during the review, the United Kingdom submitted revised estimates for these categories based on the default tier 1 EFs reported in the Revised 1996 IPCC Guidelines. The impact of these revised estimates is an increase in emissions of 39.25 Gg CO_2 eq, or 0.01 per cent of total sectoral GHG emissions, for 2012. The ERT agrees with the revised emissions estimates.

[10] CH_4 emissions from stationary combustion are not a key category, and solid fuels transformation is neither key nor the subcategory of the fuel combustion. However, since the calculation procedures for issues included in this paragraph are discussed as a whole, the individual categories are not assessed in separate sections.

[11] A joint programme of monitoring and evaluation of the long-range transmission of air pollutants in Europe under the UNECE Convention on Long-range Transboundary Air Pollution and the European Environment Agency. Available at <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013>.

Road transportation: liquid fuels – CO_2

43. The ERT noted that the CO_2 EF for gasoline for road transportation (70.00 t/TJ in 2012) is among the lowest of all reporting Parties (ranging from 68.61 t/TJ to 76.36 t/TJ) and is 4.1 per cent lower than the IPCC default values (73.00 t/TJ). In response to questions raised by the ERT during the review, the United Kingdom stated that communications with the United Kingdom Petroleum Institute Association (UKPIA) have revealed a source of carbon factors for petroleum fuels in Europe which the inventory agency plans to review in detail. As this report provides carbon factors for recent fuel formulations, the review will include consideration of how these and current country-specific carbon factors apply to the United Kingdom fuels across the time series taking into account fuel formulation changes. In addition, the Party stated that preliminary investigations suggest that the difference between the IPCC default net calorific value (NCV) and that used by the United Kingdom may be a factor responsible for the United Kingdom's lower than expected IEFs. The ERT recommends that the United Kingdom review this report in detail and investigate whether the EFs that are currently used are accurate. In addition, the ERT recommends that the Party report the findings of this review in the NIR.

Oil and natural gas: natural gas – CH_4

44. The United Kingdom has reported in the NIR that the natural gas network operators use a common industry leakage model to derive the annual estimates of fugitive emissions from natural gas transmission and distribution systems. However, during the course of the previous review the Party confirmed that this model only contains information on the estimation of emissions for the low- and medium-pressure transmission/distribution systems, and that fugitive emissions from the high-pressure part of the natural gas transmission system are based on fugitive emissions surveys conducted for the National Transmission System (NTS) compressor stations and terminals. The ERT reiterates the recommendation made in the previous review report that the United Kingdom improve the transparency of the description in the NIR of the methodology followed for the estimation of fugitive emissions from natural gas transmission and distribution systems.

45. The United Kingdom uses a higher-tier model to estimate CH_4 emissions from natural gas transmissions and distribution. The previous ERT recommended that the United Kingdom perform the following exercise in order to verify the emission estimates obtained by the higher-tier model: calculate the emissions from natural gas transmission and distribution by applying the tier 1 EFs included in table 2.16 of the IPCC good practice guidance and compare those emission estimates with the estimate obtained from the United Kingdom National Grid leakage model, and provide the conclusion of this comparison in the NIR. The results of this comparison were not provided in the NIR. However, during the review week, in response to a question raised by the ERT, the Party confirmed that the inventory agency has requested up-to-date estimates of the length of pipelines in the United Kingdom transmission and distribution systems from the four gas network operators in the country and has carried out some preliminary calculations while awaiting a response. The ERT recommends that the United Kingdom complete this exercise and report the findings in the annual submission.

4. Non-key categories

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O

46. In the 2013 review report, the ERT recommended that the United Kingdom perform a review of its CO_2 EF for jet kerosene for civil aviation (69.92 t/TJ), which was the lowest among the values reported by Parties (ranging from 69.92 to 74.93 t/TJ) and lower than the IPCC default (72.80 t/TJ). The 2014 ERT noted that although the CO_2 IEF for jet kerosene for civil aviation had been revised upwards in the 2014 submission (71.72 t/TJ), the mass-

based CO_2 EF for jet kerosene reported in the 2014 NIR (page 147) was the same as that reported in the 2013 NIR (page 140), and also noted that no information regarding a revision had been provided in the NIR. In response to a question on this issue raised by the ERT during the review, the United Kingdom explained that the calorific value, not the mass-based EF, had been revised. Therefore, it did not consider this a revision and did not detail the changes in the NIR. In addition, the Party provided supporting documentation to the ERT referencing data obtained from the UKPIA to justify the use of this value. The ERT agrees with the new CO_2 IEF (71.75 t/TJ).

Railways: solid fuels – CO_2, CH_4 and N_2O

47. As was noted by the previous ERT, the United Kingdom reports "NO" for solid fuel consumption and the associated emissions from railways for the years prior to 2005, while for the rest of the time series (2005–2012) solid fuel consumption and the respective associated emissions were reported. In response to questions raised by the ERT during the review, the United Kingdom explained that coal consumed by railways prior to 2005 was actually included under "other industrial combustion", and that the notation key included elsewhere ("IE") should have been used. The ERT recommends that the United Kingdom improve the time-series consistency of its estimates and consider reallocating the relevant emissions from "other industrial combustion" to railways in its annual submission. In addition, the ERT recommends that the ERT use the correct notation key in the CRF tables.

Coal mining and handling: solid fuels – CH_4

48. The United Kingdom has reported "IE" in CRF table 1.B.1 for the associated emissions from post-mining activities of surface mines, and explained in a comment that these emissions are included in the post-mining activities of underground mines. However, as was noted in the previous review report, this explanation is not accurate, as these emissions are actually included in the reported emissions from mining activities of surface mines. The ERT reiterates the recommendation made in the previous review report that the Party revise the comment on the use of the notation key "IE" in CRF table 1.B.1 accordingly.

C. Industrial processes and solvent and other product use

1. Sector overview

49. In 2012, emissions from the industrial processes sector amounted to 24,973.31 Gg CO_2 eq, or 4.3 per cent of total GHG emissions. Since 1990, emissions have decreased by 56.5 per cent in the industrial processes sector. The key drivers for the fall in emissions in the industrial processes sector are the reduction in HFC emissions from the production of halocarbons owing to the closure of the two hydrochlorofluorocarbon-22 (HCFC-22) production plants and the reduction in N_2O emissions from nitric acid and adipic acid production because of the closure of some plants and the installation of N_2O abatement systems. Further reductions can be attributed to the decreases in CO_2 emissions from mineral products (38.1 per cent) and metal production (60.5 per cent), and the decreases in PFC emissions from metal production (96.9 per cent). These reductions were partially offset by a substantial increase in HFC emissions from consumption of halocarbons (935.5 per cent, since 1995). Within the industrial processes sector, 57.6 per cent of the emissions were from the consumption of halocarbons and SF_6, followed by 26.0 per cent from mineral products, 11.2 per cent from chemical industry and 4.5 per cent from metal production. Production of halocarbons and SF_6 accounted for 0.6 per cent. Emissions from the solvent and other product use sector have been reported as either "NE" or "NO", depending on the categories.

50. The United Kingdom has made recalculations between the 2013 and 2014 annual submissions for the industrial processes sector. The most significant recalculation made by the United Kingdom between the 2013 and 2014 annual submissions was in the following category: metered dosed inhalers (MDIs). The recalculation was made following changes in AD and methodology, mainly by replacing previous assumptions on the use of MDIs based on the United Kingdom's share of estimated European Union (EU) emissions. Compared with the 2013 annual submission, the recalculation decreased emissions in the industrial processes sector by 1,101.31 Gg CO_2 eq (4.2 per cent), and decreased total national emissions by 0.2 per cent. The recalculation was adequately explained.

51. The NIR is comprehensive in terms of coverage of categories and gases and contains information on the methodologies (including AD and EFs applied), uncertainty, recalculations, and QA/QC procedures by subcategory. However, transparency can be improved for some categories (see paras. 54 and 59 below), and consistency between what is reported in the NIR and the CRF tables need to be enhanced in some cases, especially where the NIR is intended to include numerical descriptions of GHG emissions, including impact of recalculations (see para. 59 below). The ERT also noted some cases of varying use of units in the NIR tables for recalculations. The ERT therefore recommends that the United Kingdom improve the consistency between what is reported in the NIR and in the CRF tables focusing on the numerical descriptions of GHG emissions, including the impact of recalculations, and improve the consistency in the use of units in the NIR tables.

52. Regarding key category analysis, the ERT noted that the United Kingdom conducts the key category analysis at the level of sector total for HFCs, PFCs and SF_6. It also noted that HFC emissions from consumption of halocarbons and SF_6 in 2012 were 13,932.23 Gg CO_2 eq (55.8 per cent of the industrial processes sector total) where the subcategories of refrigeration and air-conditioning equipment, aerosols/MDIs and foam blowing were respectively 45.3 per cent, 7.9 per cent, 1.3 per cent of the sector total. The explanation provided in annex 1 of the NIR (e.g. table A1.1.7) shows that the key category analysis is currently conducted using disaggregated subcategories from the industrial processes sector that have a smaller contribution to the sector/national total. The ERT therefore recommends that the United Kingdom conduct the key category analysis for F-gases at the subcategory level (e.g. HFCs from refrigeration and air-conditioning equipment) for its annual submission, especially with regard to HFCs, in light of the increasing trend for these emissions in recent years and in order to prioritize the improvement of its reporting of the F-gas emitting sources in future annual submissions.

2. Key categories

Nitric acid production – N_2O

53. The ERT noted that, in response to a recommendation made in the previous review report, the United Kingdom provided two new tables in the NIR containing information on how methods and data sources are combined to cover the whole time series as consistently as possible. The ERT commends the United Kingdom for its efforts in enhancing the transparency of its reporting. In response to a question raised by the ERT during the review regarding emission estimates and QA/QC, the United Kingdom also provided information that plant operators, through accreditation under the United Kingdom's Environment Agency Monitoring Certification Scheme, follow monitoring standards, including standards for emissions and QA/QC. The ERT recommends that the Party include this information in the NIR. The ERT also noted that the NIR does not include information on the reason for the drop in the N_2O IEF from 2011 to 2012, although information was provided during the review that the abatement system at the larger of the two remaining nitric acid production sites in the United Kingdom became fully operational in 2012. The ERT recommends that the United Kingdom include the reason for the change in the N_2O IEF, together with

information on specific abatement measures taken at the two nitric acid production sites, in its NIR.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

54. The United Kingdom applies a tier 2 bottom-up method using a country-specific model to estimate emissions from consumption of halocarbons in refrigeration and air-conditioning equipment. For the other subcategories, the Party also uses a bottom-up model. In response to a question raised by the ERT during the review regarding how collection/destruction is accounted for in the models for consumption of halocarbons and SF_6, the United Kingdom explained that collection/destruction of HFCs is accounted for within the 'disposal loss rate' for each subcategory, where the disposal loss rate details the percentage of F-gas within each unit that is emitted at end of life, with the remainder being either collected or destroyed. In the case of refrigeration and air-conditioning equipment, the disposal loss rates for each subcategory are sourced from the ICF International report *Development of the GHG Refrigeration and Air Conditioning Model* (2011) and updated annually following a comparison with British Refrigeration Association data and according to the disposal loss rate projections detailed in the above-mentioned reference paper. The United Kingdom also explained that through EU regulation (EC) No. 842/2006, F-gases must be recovered during maintenance, servicing and at end-of-life, for: (1) stationary refrigeration and air-conditioning equipment, solvents, fire protection and high-voltage switchgear; (2) refillable or non-refillable F-gas containers; and (3) all other systems to the extent that it is technically feasible and does not entail disproportionate cost. In light of the extensive coverage of the legal obligation for F-gas recovery, the ERT recommends that the United Kingdom incorporate the above-mentioned information in the NIR to enhance the transparency of its reporting, but especially with regard to how collection/destruction is accounted for in the models for estimating emissions from consumption of halocarbons and SF_6.

55. The ERT noted some inconsistencies in the AD and/or emissions reported (e.g. for industrial refrigeration – HFC125, the disposal reported (0.24 t in 2011) is larger than the initial charge (0.15 t in 1991), or is being reported as disposed of before the lifetime reported in the NIR). In response to a question raised by the ERT during the review, the United Kingdom acknowledged a discrepancy within the refrigeration and air-conditioning model for the industrial refrigeration source, between the main calculations that the model performs and the CRF output function of the model. The ERT recommends that the Party continue to refine the underlying assumptions and methodologies of the models used, together with conducting checks of the consistency of reported AD.

56. Regarding foam blowing, the United Kingdom uses a method corresponding to the IPCC tier 2 bottom-up approach. In the NIR, the Party explains that emission estimates are done by determining the size of the bank in a given year. In response to a question raised by the ERT during the review, the Party further explained that the EF was determined based on a combination of country-specific data on the HFCs contained in the foam and the time-dependent rate of loss of HFCs. The ERT noted that despite the description in the NIR of how emissions of HFCs from foams can occur during manufacture, lifetime and disposal, the United Kingdom only reports emissions under stocks (lifetime) and not under manufacturing or disposal (both are reported as "IE" in CRF table 2(II).F). In response to a question raised by the ERT during the review, the United Kingdom explained that the data from the model used to estimate emissions from foam blowing have been aggregated in its database, which did not have the capability to distinguish emissions separately for manufacturing, stocks and disposal. The ERT therefore recommends that the United Kingdom provide a more specific explanation in the NIR regarding how it has determined the EF(s) for foam blowing and indicate more consistently whether or not the emissions

from manufacturing, stocks and disposal are reported separately, or provide clear reasons for why these emissions are aggregated when reporting.

57. The ERT also noted that the emissions from foam blowing reported in table 4.29 in the NIR (e.g. 4.11 t for XPS Boards) did not match those reported in CRF table 2(II).F (e.g. 203.53 t for HFC-134a and 109.60 t for HFC-152a), and that table 4.23 in the NIR indicates that HFC emissions from other metal production are confidential ("C"), whereas emissions are reported in CRF table2(I). In response to a question raise by the ERT during the review, the United Kingdom confirmed that in both cases the information reported in the CRF tables is correct, and that the respective sections in the NIR need correction. The ERT therefore recommends that the Party improve its QC procedures to ensure consistent reporting between the NIR and the CRF tables prior to submission, but in particular to ensure the provision of correct information in the tables of the NIR regarding emissions.

3. Non-key categories

Ammonia production – CO_2

58. In response to a recommendation made in the previous review report to investigate the reason for the low IEF for ammonia (NH_3) production, the United Kingdom has added an explanation in its NIR, that each plant will have a different intrinsic efficiency, which in part reflects the age of the plant and the technology used, and that the United Kingdom's IEF of 1.873 t CO_2/t NH_3 averaged across 1990–2012 (corrected to include natural gas use for fuel) is comparable to the default EFs shown in the 2006 IPCC Guidelines for modern European plants (1.694 t CO_2/t NH_3) and typical plants (2.104 t CO_2/t NH_3), each including natural gas use for fuel. The ERT acknowledges this comparability with the most recent inventory-related scientific knowledge, and also notes the fact that in the case of the United Kingdom, natural gas is the only fuel used as a feedstock, which would lead to a lower IEF compared with those countries where heavy fuel oil, coal, oil coke and so on are used.

59. The current ERT also noted that the United Kingdom made several corrections following the recommendations made in the previous review report, which included the correction of the figure on feedstock used to calculate the IEF to exclude the natural gas used for acetic acid and acetic anhydride production, and the correction of production amount at one site. The ERT also noted that the descriptions of these issues within the same NIR section (p. 279 major improvements, p. 283 table 4.11, table 4.12) are different in each subsection, which reduced the transparency of the NIR. In particular, the ERT took note of the varying use of units in the tables under the sections for "Source Specific Recalculations". The ERT therefore recommends that the United Kingdom improve the consistency of its description of issues in the NIR, especially regarding quantitative data, and focus on the consistent use of units.

Iron and steel production – CH_4 and N_2O

60. In previous annual submissions, the United Kingdom estimated emissions of CH_4 and N_2O from flaring in iron and steel production of blast furnace gas using the default EFs presented in the EMEP-EEA Guidebook.[12] As these EFs were removed from the most recent version of the Guidebook, in its 2014 annual submission the United Kingdom opted to use the default tier 1 EFs reported in the 2006 IPCC Guidelines, citing a lack of default EFs in the Revised 1996 IPCC Guidelines. However, while the ERT accepts that fuel-specific EFs are not provided in the Revised 1996 IPCC Guidelines, default EFs for CH_4 and N_2O emissions from combustion of coal have been provided.

[12] Available at <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013>.

61. The values of the default fuel-specific tier 1 EFs in the 2006 IPCC Guidelines are 1 kg CH_4/TJ and 0.1 kg N_2O/TJ, while the corresponding values for coal specified in the Revised 1996 IPCC Guidelines are higher, namely 10 kg CH_4/TJ and 1.4 kg N_2O/TJ. The ERT was of the view that the tier 1 values contained in the Revised 1996 IPCC Guidelines are applicable to any coal-derived products, such as blast furnace gas, and that by choosing the default tier 1 EFs in the 2006 IPCC Guidelines without providing other information to support the claim that blast furnace gas is not individually covered in the Revised 1996 IPCC Guidelines the Party's reporting is not in line with the IPCC good practice guidance, and that this is a potential underestimation of CH_4 and N_2O emissions.

62. This issue was therefore included in the list of potential problems and further questions raised by the ERT. The United Kingdom submitted revised estimates for this category based on the default tier 1 EFs reported in the Revised 1996 IPCC Guidelines. The impact of these revised estimates is an increase in emissions of 1.74 Gg CO_2 eq, or 0.01 per cent of total sectoral GHG emissions, for 2012. The ERT considers that the revised estimates resolved the issue.

D. Agriculture

1. Sector overview

63. In 2012, emissions from the agriculture sector amounted to 52,125.82 Gg CO_2 eq, or 8.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 20.4 per cent. The key drivers for the fall in emissions are a decrease in the number of cattle (a decrease of 18.8 per cent), of sheep (a decrease of 27.6 per cent) and of swine (a decrease of 40.6 per cent), and a reduced input of mineral fertilizers (29.4 per cent reduced), of manure nitrogen (N) applied to soil (23.4 per cent reduced), and pasture, range and paddock manure (18.8 per cent reduced). Within the sector, 52.0 per cent of the emissions were from agricultural soils, followed by 30.0 per cent from enteric fermentation and 17.8 per cent from manure management. The remaining 0.1 per cent was from other (agriculture). The United Kingdom reports the notation keys not applicable ("NA") and "NO" for rice cultivation and field burning of agricultural residues, and "NA" for prescribed burning of savannahs.

64. The United Kingdom has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by the United Kingdom between the 2013 and 2014 annual submissions were in the following categories: enteric fermentation and agricultural soils. The recalculations were made in response to the recommendations in the 2013 annual review report and updates in AD. Compared with the 2013 annual submission, the recalculations increased emissions in the agriculture sector by 839.68 Gg CO_2 eq (1.6 per cent), and increased total national emissions by 0.2 per cent. However, these recalculations were not adequately explained in the NIR. The ERT noted that there are inconsistencies between what is reported in chapter 10 of the NIR, recalculation and improvements, and CRF table 8(a) regarding recalculations for enteric fermentation and manure management. In response to the questions raised by the ERT during the review regarding these recalculations, the United Kingdom acknowledged the inconsistencies and explained that they arose because the Party erroneously compared the 2014 annual submission with an earlier 2013 submission (v1.1). The recalculation values reported in the 2014 NIR are therefore incorrect. The ERT recommends that the United Kingdom enhance its QC procedures so that what is reported in the NIR and CRF tables is fully consistent, but especially with regard to values for emission estimates.

2. Key categories

Enteric fermentation – CH_4

65. The United Kingdom used tier 1 default EFs for all cattle subcategories, excluding adult beef and dairy cattle, in its estimation of CH_4 emissions from enteric fermentation. For non-dairy cattle, the United Kingdom applied a country-specific digestibility of feed (DE) value of 65 per cent, which is on the upper side of the default range (60–65 per cent) for non-dairy cattle – grazing provided by the Revised 1996 IPCC Guidelines (p. 4.32, table A-2). In response to questions raised by the ERT during the review, requesting the Party to provide details of the basis for its selection of the 65 per cent value, the United Kingdom explained that the best estimate of a country-specific value for DE for non-dairy cattle has been made using available literature regarding energy digestibility coefficients of ruminant feeds and the considered opinion of a ruminant nutrition expert regarding diet. The ERT noted that during grazing, which represents a major component of the diet of non-dairy cattle, the forage quality tends to be lower than for dairy cattle. Using the information on DE values for fresh grass, grass silage and maize given in the Party's NIR (section 6.2.2.2) the ERT took the weighted average of these DE values, based on the proportion of these feeds provided in table A 3.5.5 of annex 3 of the NIR. The minimum value of this weighted average for non-dairy cattle was 67.7 per cent. Therefore the ERT concluded that the use of the 65 per cent DE value is conservative and will not lead to an underestimation in emissions. In addition, the United Kingdom acknowledged the recommendations made in the previous review report regarding the need for the improvement of DE data, and explained that these recommendations are being addressed through commissioned research projects, which will be incorporated into the 2015 annual submission. The ERT recommends that the United Kingdom implement this improvement as explained.

66. The previous review report strongly recommended that the United Kingdom document the national circumstances in order to justify its use of the tier 1 methodology for mature breeding sheep and the related reduction factor for producing lambs. It was also strongly recommended in the previous review report that the United Kingdom apply the IPCC tier 2 methodology for sheep. In response to a question raised by the ERT during the review, the United Kingdom explained that previously a country-specific EF given by Sneath et al. (1997) for enteric fermentation from adult sheep of 5.1 kg CH_4/animal/year was used, and that the United Kingdom then derived a value for lambs based on the ratio of live weight, assuming an average live weight of 50 kg for adult sheep and 20 kg for lambs (based on market report values at the time for finished lambs); that is, the lamb EF was 40 per cent of the adult sheep EF. However, for the current GHG inventory, the United Kingdom decided it could not justify a country-specific adult sheep EF based on a single study, so retained the IPCC default tier 1 value of 8 kg/head/year, but applied the corrections for EFs of lambs as detailed by Sneath et al. A further correction for EFs of the categories "lambs" and "other sheep" is made based on the proportion of the years that the animals are alive. For lambs, this was derived from a survey of 778 farms (Wheeler et al., 2012). The United Kingdom also provided to the ERT all related reference documents during the review. From these explanations and reference documents, the ERT considers that the use of the tier 1 methodology with corrections to the EFs based on country-specific parameters (lifespan and live weight) is acceptable. However, the ERT recommends that the United Kingdom apply a methodology that more closely reflects the country-specific conditions. The ERT is of the view that this could be attained by moving to the IPCC tier 2 methodology for the sheep subcategory, in addition to documenting national circumstances leading to methodological choice.

Manure management – N_2O

67. The United Kingdom reports that the nitrogen excretion (Nex) rates for all animals are based on the models introduced in the final report of a research project (DEFRA,

2006).[13] In the NIR, there is no information on the references for this model. In response to questions raised by the ERT during the review, the United Kingdom provided a document explaining this model together with an interpretation note from one of the authors of the document, which provided the Nex values used in the inventory. Specifically for dairy cattle, the N-balance approach described in the above-mentioned DEFRA report was used to derive the Nex rates for average dairy cattle for each year. An empirical relationship between average milk yield and Nex was then derived. The ERT considers that this country-specific methodology is in line with the IPCC good practice guidance, and recommends that the United Kingdom include information in its NIR on this methodology in the form of a summary explanation of how the Nex values used in the inventory were derived.

Agricultural soils – N_2O

68. In the previous review report, it was noted that the United Kingdom used a more detailed nitrogen flow methodology with country-specific EFs when reporting NH_3 emissions under the EU directive and the Convention on Long-range Transboundary Air Pollution (LRTAP) than in its national GHG inventory submitted under the UNFCCC. Further, during the previous review, the United Kingdom informed the ERT that it is seeking to unify the approaches to the reporting of NH_3 and nitrogen oxide (NO_X) losses between the two inventories through a GHG research and development platform, which will be completed in 2015.[14] In its 2014 NIR, the United Kingdom reports that it is improving the link between its NH_3 and GHG inventories, and incorporating NO_X in a study (desk/experimental) that will review the current value of 20 per cent of N lost as NH_3 and NO_X. The ERT reiterates the encouragement from the previous review report that the United Kingdom improve the accuracy and consistency of its estimation of indirect N_2O emissions from atmospheric deposition of evaporated NH_3 and NO_X by unifying the approaches used when reporting under different instruments: the UNFCCC; the LRTAP; and the EU national emission ceilings directive. The ERT also encourages the United Kingdom to complete this improvement in time to report the results in its 2015 annual submission.

E. Land use, land-use change and forestry

1. Sector overview

69. In 2012, net removals from the LULUCF sector amounted to 6,978.39 Gg CO_2 eq. Since 1990, net removals have increased by 471.4 per cent. The key drivers for the rise in removals are decreased emissions owing to conversion of cropland to grassland and increased carbon stock in mineral soils for grassland remaining grassland. Within the sector, 16,637.14 Gg CO_2 eq of net removals were from forest land, followed by 7,661.75 Gg CO_2 eq from grassland and 1,168.32 Gg CO_2 eq from other. Net emissions were reported from cropland (11,745.84 Gg CO_2 eq) and 6,383.21 Gg CO_2 eq from settlements. Wetlands accounted for 359.76 Gg CO_2 eq. Emissions from other land are reported as "NO". Harvested wood products (reported under other (LULUCF)) accounted for net removals of 997.12 Gg CO_2 eq.

70. The United Kingdom has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by the United

[13] Project WT0715NVZ (Nitrogen and phosphorus output standards for farm livestock), final report 'Nitrogen and phosphorus output of livestock excreta'. Available at <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=13963>.

[14] FCCC/ARR/2013/GBR, paragraph 69.

Kingdom between the 2013 and 2014 annual submissions were in the following categories: forest land and grassland. The recalculations were made in response to the 2013 annual review report. Compared with the 2013 annual submission, the recalculations increased removals in the LULUCF sector by 4,175.87 Gg CO_2 eq (126.2 per cent). The recalculations were adequately explained.

71. In response to recommendations made in previous review reports, the United Kingdom enhanced the completeness of the inventory by including estimates for forest planted prior to 1921 (see para. 75 below). Related to this improvement the United Kingdom also changed to a more detailed forest carbon accounting model (see paras. 74 and 98 below). The ERT commends the United Kingdom for the major improvements.

72. In response to recommendations made in previous review reports, that the Party resolve inconsistencies in total land area over the time series,[15] the United Kingdom reports in the 2014 NIR the land-use change matrices meeting the total land area of the United Kingdom. The ERT commends the United Kingdom for this improvement.

73. The areas allocated to land-use categories in 1990 as reported in the land-use change matrix (NIR table 7.1) were changed from the previous NIR, but without elaborating on these changes in the 2014 NIR. In response to the question raised by the ERT during the review, the United Kingdom informed the ERT that these changes are the result of two improvements. In this annual submission the area of forest is calculated from post-1920 planting records and pre-1920 estimated planting records using the CARBINE model (see also para. 74 below), and the known forest areas and ages are taken from the National Inventory of Woodland and Trees (NIWT).[16] In previous annual submissions the forest area was taken from the Global Forest Resources Assessment 2010. In all submissions, a buffer area (area required to make up the total area of the United Kingdom after all other data sources have been taken into account) was allocated to undisturbed grassland. In the present annual submission, this calculation of the buffer area was improved to ensure that the total area of the United Kingdom remained constant throughout the time series. The ERT recommends that the United Kingdom incorporate such an explanation, when appropriate.

2. Key categories

Forest land – CO_2

74. In response to the recommendations made in previous review reports, the United Kingdom uses new and much more detailed AD in the 2014 annual submission, for which it was necessary to apply a different carbon accounting model for the forest land category. The CARBINE carbon accounting model, which has been in existence since the late 1980s, was applied for the first time in the 2014 annual submission in the calculations for the forest land category. During the review, the United Kingdom provided the ERT with additional information and documentation on this model[17] and with references to peer-reviewed publications on this model. The United Kingdom also informed the ERT that a publication is planned that will describe the design and use of the version of the CARBINE model developed for use in the national GHG inventory calculations. The ERT commends the United Kingdom for these major improvements and encourages the United Kingdom to include information on the handling of the main parameters of the five pools in CARBINE in the NIR (i.e. in an annex) in order to further improve the transparency of its reporting on the CARBINE model.

[15] Such as FCCC/ARR/2013/GBR, paragraph 76.

[16] Available at: <http://www.forestry.gov.uk/forestry/HCOU-54PG9U>.

[17] Summarized in the paper "Supplementary Report No. 1: Information on the CARBINE forest sector carbon accounting model, 19th August 2014".

75. In previous annual submissions the United Kingdom reported forest areas based on annual records for new planting of forests as reported by the Forestry Commission, starting in the year 1921. In the current annual submission, for the first time, forest areas are reported based on statistics from NIWT, compiled by the Forestry Commission. This forest inventory involved a combination of remote sensing and ground surveys carried out in the 1990s. Some data were adjusted to achieve consistency with a reference reporting year of 2000, by referring to records for new planting and felling. The species composition was based on the ground surveys carried out as part of the NIWT survey of forest area. In the 2014 submission 12 conifer species and 5 broadleaf species are covered, compared to a total of 2 (all species represented as either sitka spruce (conifer species) or beech (broadleaf species)) in previous annual submissions. The ERT commends the United Kingdom for these improvements and the additional documentation provided in response to questions raised by the ERT during the review.

76. In previous annual submissions the United Kingdom reported carbon stock changes using a rotation of 59 years for the vast majority of the conifer areas and 90 years for broadleaf forest areas. In the current annual submission, improved information of the management of forest areas is used. For the publicly owned forests the main split is between clear-felling with thinning and clear-felling with no thinning, while only very small proportions of the areas are not under management for production or managed under continuous cover. In response to a question raised by the ERT during the review on the management practices for privately owned forest, the United Kingdom informed the ERT that the pattern of management for privately owned forests is known to differ from that observed in publicly owned forests: in particular, more of the forest area in privately owned forests is not under management for production. However, systematic data on the management of privately owned forests were not available. In response to questions raised by the ERT, the United Kingdom provided the ERT with information that the management prescriptions for areas of privately owned forests were determined by a modelling procedure which optimized the assignment of management prescriptions to these forests, such that the modelled levels of total wood production from public and private forests was consistent with reported statistics for wood production. The provided report [18] holds information on the areas under each of the four management prescriptions and the rotation ranges per species, and shows that the majority of broadleaf forest areas in the United Kingdom are not under management for production, and that the proportion of conifer forest area not under management is much smaller than the broadleaf area under management but is not insignificant. The ERT commends the United Kingdom on this improvement, and recommends that the United Kingdom continue its efforts to gather information on the management of privately owned forests and include information on the management prescriptions and rotation ranges in its NIR to further improve the transparency of its reporting.

77. The CARBINE model takes a similar approach to the model used for previous annual submissions (namely C-Flow) in representing soil carbon stocks and dynamics. Inputs of organic matter from deadwood, litter and the turnover of fine roots are represented. Soil carbon stocks and the losses of carbon from soil because of decomposition of soil organic matter are represented as three components, involving fast-turnover, slow-turnover and recalcitrant soil carbon pools. For organic soils, the default parameterization of the soil submodel in CARBINE was modified to achieve closer agreement with results predicted by the C-Flow model. During the review, in response to questions raised by the ERT, the United Kingdom informed of its decision to handle soil carbon dynamics of organic soils to

[18] "Changes to the representation of forest land and associated land-use changes in the 1990–2012 UK Greenhouse Gas Inventory."

be consistent with previous inventories, in the absence of properly published peer-reviewed supporting evidence, knowing that the resulting pattern of soil carbon stock change is only modestly consistent with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF), as explained in the above-mentioned report.[19] The United Kingdom also informed the ERT that it recognises that the detailed representation of soil carbon dynamics in forest carbon accounting models applied to United Kingdom forests requires further improvement, and that work is ongoing for the next annual submission and that there is a need to improve the documentation of the representation soil carbon dynamics associated with forest land. The ERT recommends that the United Kingdom continue its efforts to improve the estimates on soil carbon and related documentation. The ERT reiterates the encouragement of the previous review report that the Party consider the long soil carbon transition periods (50–750 years),[20] and further encourages the United Kingdom to improve the documentation of the carbon stock changes to and from forest land related to soil carbon and report on progress in its NIR.

78. The United Kingdom reports different areas for land changed to forest land and afforested land under the Convention and under the Kyoto Protocol: for the Convention reporting the fiscal year (April–March) is used, while for the reporting under the Kyoto Protocol these data are adjusted to the calendar year. For the land-use matrix the United Kingdom also reports by calendar years since all sources (except new planting) use this time frame. To improve transparency, the ERT encourages the United Kingdom to use the calendar year to estimate the areas for land changed to forest land for reporting under both the Convention and the Kyoto Protocol.

Cropland and grassland – CO_2

79. The United Kingdom reports that the improvement project on the impacts of the changes in the management practice for soil carbon is still ongoing and that therefore the results could not be incorporated in the current submission. The United Kingdom also reports on a planned follow-up project on the effect of management practices on above- and below-ground biomass carbon stocks in cropland and grassland. The ERT looks forward to seeing the results of the improvement project in the 2015 inventory submission and encourages the United Kingdom to provide information on the planning for the follow-up project in the same submission.

80. While the area of organic soil under cropland is a minor area (150.47 kha) and is predominantly lowland drainage, this is not the case for organic soil under grassland (1,214.70 kha) which almost only occurs in the overseas territories (OTs) and crown dependencies (CDs). However, the United Kingdom has reported associated emissions and removals from organic soil in OTs and CDs as "NO". In section A3.6.12 of its NIR the United Kingdom explains that "A lack of suitable data for the Caribbean territories (discussed in the 1990–2006 NIR) makes it impossible to create inventories for them at present time."[21] The ERT is of the view that this reporting is not in line with the IPCC good practice guidance for LULUCF. The ERT recommends that the United Kingdom research again the possibility of generating suitable data and report on the progress to estimate emissions and removals from organic soil in its annual submission and, until additional information becomes available, report using the notation key "NE".

[19] "Changes to the representation of forest land and associated land-use changes in the 1990–2012 UK Greenhouse Gas Inventory."

[20] FCCC/ARR/2013/GBR, paragraph 80.

[21] *UK Greenhouse Gas Inventory, 1990 to 2006, Annual Report for Submission under the United Nations Framework Convention on Climate Change*, page 397. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4303.php>.

81. The United Kingdom does not report orchards under cropland remaining cropland, but instead reports estimates of emissions and removals under the forest land category and reports that this will be rectified in future annual submissions. The ERT reiterates the recommendation made in the previous review report that the Party assign orchards to cropland in its annual submission and provide documentation on the method used to estimate the carbon stock changes over time, and ensure that changes in the area of orchards over time have been taken into account.

82. In the CRF tables, the United Kingdom reports land-use changes from cropland to grassland up to 2010. Since the year 2010 such land-use changes are no longer reported. In response to a question raised by the ERT during the review, the United Kingdom informed the ERT that this was a mistake and that land-use conversions continue to happen. The United Kingdom explained that the last Countryside Survey was conducted in 2007 and was used to estimate the 2000–2009 land-use change values. These values should have been rolled forward for 2010–2012; however, this was overlooked and the projected values of land-use change were used instead for the emission estimates. The United Kingdom informed the ERT that this mistake will be corrected in the next annual submission. The ERT recommends that the United Kingdom implement this correction in the next annual submission.

Land converted to settlements – CO_2

83. During the 2013 review, in response to questions raised by the ERT, the United Kingdom provided information on the opposite trends of changes in carbon stock in living biomass and in soil for land converted to settlements, and referred to the situation that half of the urban areas are (still) green space. However, the United Kingdom reports the carbon stock change in living biomass as "NO". The 2014 ERT noted that this reporting is not consistent with the information provided by the Party during the 2013 review, which states that half of the urban areas are green space. The ERT recommends that the United Kingdom investigate the internal consistency of the reported changes in carbon stock and more transparently provide information on the methods used in the next annual submission.

Wetlands – CO_2

84. The United Kingdom reports the area of wetlands for England, Northern Ireland, Scotland and Wales and reports the net carbon stock changes in soils for areas undergoing active commercial peat extraction or where extraction has ceased since 1990. Carbon stock changes in living biomass in OTs for forest land converted to wetlands and the related area are reported in CRF table 5D using the notation key "NE", while for wetlands remaining wetlands and all other land conversions the areas are reported as "NO". The ERT recommends that the United Kingdom assess the appropriateness of the use of the notation key "NE" and report on this in its next annual submission.

F. Waste

1. Sector overview

85. In 2012, emissions from the waste sector amounted to 23,716.21 Gg CO_2 eq, or 4.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 54.3 per cent. The key driver for the fall in emissions is the reduction in the amount of waste landfilled, following the EU directive 1999/31/EC on the landfill of waste, and the increase in gas recovery from landfills. Within the sector, 86.8 per cent of the emissions were from solid waste disposal on land, followed by 11.9 per cent from wastewater handling and 1.4 per cent from waste incineration. Emissions from other (waste) are reported as "NA".

86. The United Kingdom has made recalculations between the 2013 and 2014 annual submissions for this sector, in response to recommendations in previous review reports, which are mainly due to: updates of AD including updates of sewage sludge data to improve the consistency with the agriculture sector; and new AD for waste incineration in the OTs. Compared with the 2013 annual submission, the recalculations resulted in an increase in emissions in the waste sector of 2,714.65 Gg CO_2 eq (11.8 per cent), and an increase in total national emissions of 0.5 per cent. The recalculations were adequately explained.

87. The United Kingdom has largely used country-specific methodologies with a view to improving the quality of emission estimates. In the previous review report, the ERT had identified numerous inconsistencies between the main chapters of the NIR and the annexes, and therefore recommended that the United Kingdom improve the QC checks for the NIR. However, the ERT of 2014 also identified a significant number of similar errors (e.g. although chapter 8 of the NIR refers to table A3.7.1.1 and table A3.7.1.2, no such tables exist in the annexes (the text should read table A3.7.1 and table A3.7.2)); and terminology is not standardized for waste classification (see para. 93 below). The ERT reiterates the recommendation made in the previous review report that the United Kingdom improve the QC checks in, and between, the main text of the NIR and the annexes, as well as with the CRF tables, in order to ensure the consistency of its reporting.

2. Key categories

Solid waste disposal on land – CH_4

88. The United Kingdom employs the first-order decay method with country-specific parameters (e.g. waste composition, k values and the degradable organic carbon (DOC) associated with various decomposition ratios) to estimate CH_4 emissions from solid waste disposal on land. For CH_4 recovered, the United Kingdom reported CH_4 flared and CH_4 used for power generation. Also, the United Kingdom classified estimation methods for CH_4 flared into the following landfill types: (a) modern permitted landfills; (b) older permitted landfills; (c) local authority controlled closed landfills; and (d) landfills in Scotland and Northern Ireland. During the previous review, in response to the list of potential problems and further questions raised by the ERT, the United Kingdom applied those classified methodologies in estimating CH_4 flared. However, after reviewing the revised estimates during the 2013 review, the previous ERT considered that, although the reported amount of CH_4 used for power generation and the revised amount of CH_4 flared at modern permitted landfills were assumed to be reasonable because of use of metered data, the amount of CH_4 flared at the other landfill types resulted in an inappropriate estimation, tending to overestimate the amount of recovery; hence the previous ERT applied an adjustment for CH_4 emissions from solid waste disposal on land assuming the estimated amount of CH_4 flared at landfill types (b)–(d) to be "zero", which is the default value in the IPCC good practice guidance. In the 2014 annual submission, the ERT did not find any improvements made since the final 2013 submission; the United Kingdom used the same methodologies that it had used for the final 2013 submission, without following the recommendation made in the previous review report. In response to a question raised by the ERT during the current review, the United Kingdom explained that this was due to the ongoing correspondence between the previous ERT and the United Kingdom following the submission of revised estimates in response to the list of potential problems and further questions raised during the 2013 review, and that the draft 2013 annual review report was received after the 2014 annual submission. During the 2014 review, the United Kingdom provided detailed information for CH_4 flared, and acknowledged that there are no significant developments from the methodology used for the revised estimates submitted for 2011 to those used for the 2012 inventory. After reviewing all the information provided by the United Kingdom during the current review, the ERT considered that the United

Kingdom continued to report underestimated emissions from solid waste disposal sites (SWDS) in its 2014 annual submission. During the review, the United Kingdom proposed a method for recalculating emissions from landfills which is compliant with the recommendation made in the 2013 annual review report. However, revised estimates could not submitted during the review week. The ERT therefore included this issue in its list of potential problems and further questions raised by the ERT during the review, and recommended that the United Kingdom revise the calculation of CH_4 emissions from solid waste disposal on land for the entire time series by using gas recovery data from monitored sources, as the Party proposed during the review, and submit its revised estimates for the entire time series.

89. In response to the recommendation made in the list of potential problems and further questions raised by the ERT during the review, the United Kingdom submitted revised estimates by:

(a) Omitting: (i) interpolated calculations of the quantity of CH_4 flared from 1991 to 2008; (ii) a calculation of the quantity of CH_4 flared in Scotland and Northern Ireland, derived from reported landfill CH_4 combustion in flares in England and Wales; and (iii) an estimation of the quantity of CH_4 flared at sites for which specific data are not available;

(b) Retaining: (i) reported landfill CH_4 combustion in flares in England and Wales in 2009, 2010, 2011 and 2012, based on site-specific data provided by the Environment Agency; (ii) landfill CH_4 combustion in flares in 2008, calculated as the average quantity flared in 2009, 2010, 2011 and 2012 because these landfills provided an appropriate sample from which assumptions could be developed and CH_4 recovery estimated for modern permitted landfills for 2008;

(c) Adding in the new data from preliminary results of ongoing research to improve estimates in this area, by including: (i) metered combustion of landfill gas in flares at landfill sites in Scotland; (ii) metered combustion of landfill gas in flares at closed landfill sites and landfill sites with permits under review and where data became available, in England and Wales.

90. The impact of these revised estimates is an increase in emissions of 2,012 Gg CO_2 eq, or 9.3 per cent of total sectoral GHG emissions, for 2012. The ERT considers that the revised estimates resolved the issue. The ERT encourages the United Kingdom to implement further investigations to obtain the data on the amounts of CH_4 flared.

91. The United Kingdom reports the CH_4 emissions from OTs and CDs landfills in the category other (waste), with AD and other related parameters such as the methane correction factor (MCF) and DOC degraded reported as "NA" in the CRF tables, without sufficient description of the estimation methodologies in the NIR. In response to a question raised by the ERT during the review, the United Kingdom provided elaborated information for the estimation methodologies for the emissions from OTs and CDs, and explained its planned improvements to enhance the transparency in its next annual submission. The ERT acknowledged the United Kingdom's efforts in estimating the complete geographical coverage, and recommends that the Party implement the proposed improvements to enhance the transparency of its emission estimates from SWDS in OTs and CDs in its NIR, by providing further information on methodologies to estimate emissions, and by completing the CRF tables with specific parameters such as AD, MCF and DOC.

3. Non-key categories

Wastewater handling – CH_4

92. The United Kingdom reports CH_4 emissions from domestic and commercial wastewater handling which include: procedures of treatment, digestion, composting,

farmland disposal and land reclamation, together with sludge. The ERT noted that, in response to a recommendation made in the previous review report, and to enhance transparency and accuracy regarding the representativeness of EFs employed for all activities and emissions, the United Kingdom improved the documentation of the methodology used to derive the EFs by showing the specific ratio of data sources captured, and also explained its ongoing plan to further improve the accuracy of the inventory. However, the definition of "the United Kingdom-wide aggregate factor from reporting companies" for activities without company-specific EFs indicated on page 735 in the NIR is still unclear in the 2014 annual submission. To ensure the representativeness of the employed EFs for all activities and emissions in the country, the ERT reiterates the recommendation made in the previous review report that the United Kingdom improve the transparency of the employed EFs by providing a more detailed explanation in its NIR.

Waste incineration – CO_2, CH_4 and N_2O

93. In CRF table 6.A.C, the United Kingdom reports CO_2, CH_4 and N_2O emissions from five incineration sources: accidental fires (vehicles); chemical; incineration of hospital wastes; municipal waste burning; and sewage sludge. In its NIR, the United Kingdom documents estimation methodologies for these sources except for accidental fires (vehicles). The ERT noted that some terms for waste classification are not consistent throughout the United Kingdom's submission; for example, the terms in the NIR used for AD such as "industrial waste" and "clinical waste" do not match what is reported in the CRF tables (probably intended to correspond to "chemical" and "hospital waste", respectively). To enhance transparency and consistency, the ERT recommends that the United Kingdom improve the documentation in the NIR, provide a detailed explanation of the methodology used to estimate emissions from accidental fires (vehicle) and standardize the terminology used for waste classification.

94. In the previous review report, it was recommended that the United Kingdom improve the data on emissions from the flaring of CH_4 from chemical waste and report only on the recovery of emissions that is based on metered data.[22] The ERT noted that the planned improvements related to the data on emissions from the flaring of CH_4 from chemical waste incineration have still not been implemented. In its 2014 NIR, the United Kingdom reports that when data on CH_4 flaring become available in the pollution inventory for chemical waste incineration, these data will be included in the inventory submission. The ERT encourages the United Kingdom to report only on the recovery of emissions that is based on metered data, if it becomes available in the future.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

95. Table 6 provides an overview of the information reported and parameters selected by the United Kingdom under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

[22] FCCC/ARR/2013/GBR, paragraph 105.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Issue	*Expert review team assessment, if applicable*	*Findings and recommendations*
Assessment of the Party's reporting in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1	Sufficient	There is room for improvement regarding the transparency of reporting (see paras. 98–101 and 103)
Activities elected under Article 3, paragraph 4, of the Kyoto Protocol	Forest management Years reported: 2008, 2009, 2010, 2011, 2012	
Period of accounting		Commitment period accounting
Party's ability to identify areas of land and areas of land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1	Sufficient	

96. Chapter G.1 includes the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines and decisions 15/CMP.1 and 16/CMP.1. In accordance with decision 6/CMP.9, Parties will begin reporting of KP-LULUCF activities in the submissions due by 15 April 2015 using revised CRF tables, as contained in the annex to decision 6/CMP.9. Owing to this change in the CRF tables for KP-LULUCF activities, and the change from the first commitment period to the second commitment period, paragraphs 97–103 below contain the ERT's assessment of the Party's adherence to the current reporting guidelines and do not provide specific recommendations for reporting these activities in the 2015 annual submission.

97. The United Kingdom increased the completeness of the inventory by including estimates for forest planted prior to 1921. Related to this improvement, the United Kingdom also changed to a more detailed forest carbon accounting model, CARBINE, for estimating carbon stock changes under forest land (see paras. 71 and 75 above and 98 below). The improvements resulted in recalculations for areas and emissions and removals for all activities.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO2

98. The use of the CARBINE model resulted in a recalculation of emissions and removals from afforestation and reforestation activities. During the review, in response to questions raised by the ERT, the United Kingdom provided the ERT with additional information, including parameters and the calculations in the model, showing that: (1) among other things, in the CARBINE model "early stand development" (typically 0–20 years) does not represent growth of non-tree understorey vegetation (whereas using the previous model this was included); and (2) in the first 20 years less carbon accumulation in soil is estimated, as illustrated by examples of tree types and soil stock by year since

planting.[23] The ERT noted that, in table 5 (KP-I)A.1.1, the United Kingdom uses the notation key "IE" to report the carbon stock change in below-ground biomass and in dead wood, and the Party reports in the NIR that in the next annual submission data for these two pools will be reported separately. The ERT noted that all pools are accounted for by the CARBINE model.

99. In table 5(KP-I)A.1.2 the United Kingdom uses the notation key "IE" with the explanation that the amount of harvesting of afforestation and reforestation units of land planted since the beginning of the commitment period is small, as most forest management cycles (for thinning and harvesting) operate on long time scales. Hence, for reporting, all emissions from harvested afforestation and reforestation land are included with afforestation and reforestation land which has not been harvested (table 5 (KP-I)A.1.1). In its NIR, the United Kingdom reports that very little deforestation will have taken place in the afforested areas. In response to a question raised by the ERT during the review, the United Kingdom informed the ERT that it estimates no felling in afforested land, as the shortest assumed rotation is longer than the age of the forested planted since 1990. The ERT encourages the United Kingdom to improve in its next annual submission the documentation on harvesting, thinning and (potential) felling, especially as in the coming year some harvesting is likely to start.

Deforestation – CO_2

100. The United Kingdom reports an increase in deforested areas since 2000 compared with the previous year's annual submission. The United Kingdom reports in its NIR that, to estimate the deforested areas, it assembled information from felling licences and expert judgement. In response to questions raised by the ERT during the review, the United Kingdom informed the ERT that, in addition, records of forest and non-forest land use are maintained for the public forest estates and that forest areas lost to development (i.e. settlement) are not regulated by felling licences. Based on recent country reports by the Forestry Commission for the period 2000–2012 the area data were revised. The United Kingdom provided the ERT with additional information on the annually adjusted numbers by country, the reasoning and clear references, demonstrating that the deforested area prior to 2000 is not underestimated.

101. The United Kingdom reports that only land deforested to cropland will undergo some liming. In table 5 (KP-II)4, data for England only are reported while for the other countries "NO" is reported. However, the ERT noted from the information provided by the Party during the review that most deforested land is changed to grassland. In CRF table 5(IV) emissions from agricultural lime application for grassland are reported, and in the NIR it is reported that agricultural lime application relates to all areas of grassland. In response to a question raised by the ERT during the review, the United Kingdom informed the ERT that Countryside Survey data shows that deforestation to cropland only occurs in England and that deforestation to grassland is assumed to be to grassland types which do not receive lime (e.g. restored bogs, wind farms or the creation of open habitats within forests) rather than conversion to improved pasture which does receive lime. The ERT recommends that the United Kingdom include the explanation that liming on deforested land occurs only in England in its next annual submission, to improve transparency.

[23] Matthews R, et al. 2014). *Changes to the representation of forest land and associated land-use changes in the 1990-2012 UK Greenhouse Gas Inventory*. See also Annex II of this report.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

102. With the inclusion of pre-1921 planted forest in its reporting, the United Kingdom reports a large increase in the area under forest management, compared with the previous year's annual submission. Additionally, the use of the CARBINE model resulted in a recalculation of the emissions and removals owing to, for example, refinements to the representation of the composition of forest areas and their management, notably including refined representation of rotations applied to forest areas, and the explicit representation of forest areas not under management for production. The ERT acknowledges these improvements and the resulting recalculations.

103. The United Kingdom reports in the NIR that there are currently insufficient data to include the effect of "windblow" disturbances in the inventory. During the review, in response to a question raised by the ERT, the United Kingdom provided the ERT with the following additional information demonstrating that this effect does not result in an underestimation of related emissions, but that the effect might be showing up in the observed age distribution. Additionally, public forest services and large forest management companies routinely operate a policy of "coupe switching". This involves compensating for "windthrow" disturbance events through adjustments to forest design plans and harvesting schedules. Furthermore, areas of forest that are subject to "windthrow" are routinely incorporated into harvesting schedules, so the full carbon stocks in trees will not be lost to decay; rather, a significant proportion will be harvested. The ERT recommends that the United Kingdom incorporate this information on the effect of "windblow" disturbances in its next annual submission and improve the transparency of its reporting.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

104. The United Kingdom has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[24] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

105. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

[24] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol and activities under Article 3, paragraph 4, of the Kyoto Protocol

106. The United Kingdom has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

107. Table 7 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review.

Table 7

Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2014 annual submission[a]		
	As reported	*Revised estimates*	*Final accounting quantity*[b]
Afforestation and reforestation			
Non-harvested land	–12 868 497		–12 868 497
Harvested land	IE		IE
Deforestation	5 442 501		5 442 501
Forest management	–6 783 333		–6 783 333
Article 3.3 offset[c]	0		0
Forest management cap[d]	–6 783 333		–6 783 333
Cropland management	NA		NA
Grazing land management	NA		NA
Revegetation	NA		NA

Abbreviations: CRF = common reporting format, IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] The values included under the 2014 annual submission are the cumulative accounting values for 2008, 2009, 2010, 2011 and 2012, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2012.

[b] The "final accounting quantity" is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2014 annual submission.

[c] "Article 3.3 offset": for the first commitment period, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[d] In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

108. Based on the information provided in table 7 for the activity afforestation and reforestation, the United Kingdom shall: for non-harvested land, issue 12,868,497 removal units (RMUs) in its national registry.

109. Based on the information provided in table 7 for the activity deforestation, the United Kingdom shall cancel 5,442,501 assigned amount units, emission reduction units, certified emission reduction unit and/or RMUs in its national registry.

110. Based on the information provided in table 7 for the activity forest management, the United Kingdom shall issue 6,783,333 RMUs in its national registry.

Calculation of the commitment period reserve

111. The United Kingdom has reported its commitment period reserve in its 2014 annual submission based on the national emission levels in its most recently reviewed inventory. In its NIR, the Party erroneously reported its commitment period reserve to be 2,997,072,992,070,872,567 t CO_2 eq. The United Kingdom corrected this error during the review. The ERT noted that on the basis of the submission of revised emission estimates by the United Kingdom during the review of its 2014 annual submission, its commitment period reserve changed to 2,931,785,647 t CO_2 eq. The ERT agrees to this figure.

3. Changes to the national system

112. The United Kingdom reported that there are no changes in its national system since the previous annual submission. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

113. The United Kingdom reported that there are changes in its national registry since the previous annual submission. The Party described in its NIR changes: to database structure, regarding conformance to technical standards; to the list of publicly available information; and regarding test results. The ERT concluded that, taking into account the confirmed changes in the national registry, the United Kingdom's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

114. Consistent with paragraph 23 of the annex to decision 15/CMP.1, the United Kingdom provided information relating to how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention.

115. In its NIR, the United Kingdom reports on several activities related to better understanding on how its policies could have impacts on developing countries, and how they could be addressed. For example: the Department of Energy and Climate Change (DECC) has developed a national tool (2050 Energy and Emissions Calculator model) and is supporting countries around the world to develop their own calculators to explore their options to reduce GHG emissions and help tackle energy challenges; the Department of Transport has and continues to lead work into understanding Indirect Land Use Change (ILUC) impacts from biofuels; the Department for Environment, Food and Rural Affairs (DEFRA) has funded and continues to fund research looking at embedded emissions and sustainable production and consumption; and the United Kingdom is involved in a Clean Development Mechanism (CDM) project as part of the EU ETS. In addition, the United Kingdom's International Climate Fund (ICF) will provide £3.87 billion of climate finance

from 2011–2016. This funding will be focused on helping the poorest people adapt to the effects of climate change, helping to encourage low-carbon development and helping to protect the world's forests and the livelihoods of the people who depend on them; The United Kingdom is investing £130 million in the Climate Public-Private Partnership (CP3) from the ICF. CP3 will support projects delivering renewable and efficient energy, new technology and protect natural resources in emerging and developing countries in Africa and Asia.

116. The ERT noted that the United Kingdom did not provide explicit information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. However, in response to questions raised by the ERT during the review, the Party acknowledged the following changes in its reporting under Article 3, paragraph 14: the addition of information on the 2050 Energy and Emissions Calculator model (chapter 15.2.1 of the NIR); the update to information on the scale and uses for the United Kingdom's ICF (chapter 15.2.3 of the NIR) and on additional funding to the Climate Investment Funds (chapter 15.2.4, para. 6 of the NIR); the addition of information on the 'Understanding Sustainable Energy Solutions in Developing Countries (USES)' programme (chapter 15.2.6, para. 3 of the NIR); the addition of new examples of capacity building projects (chapter 15.2.8 of the NIR); and information on the new Energy Act 2013 (chapter 15.2.9 of the NIR). The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent. The ERT reiterates the recommendation made in previous review reports that the Party, in its annual submission, explicitly report any change(s) in its information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H and/or further relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

III. Conclusions and recommendations

A. Conclusions

117. Table 8 summarizes the ERT's conclusions on the 2014 annual submission of the United Kingdom, in accordance with the Article 8 review guidelines.

Table 8
Expert review team's conclusions on the 2014 annual submission of the United Kingdom

Issue	*Expert review team assessment*	*Paragraph cross-references for identified problems*
The ERT concludes that the inventory submission of the United Kingdom is complete with regard to categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2012		
Annex A sources[a]	Complete	
LULUCF[a]	Not complete	See para. 84
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of the United Kingdom has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	

Issue	*Expert review team assessment*	*Paragraph cross-references for identified problems*
The Party's inventory is in accordance with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF	Generally	See table 4 and paragraphs 18, and 80 above
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
The Party has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did the Party provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	No	See paragraph 116 above

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance or the IPCC good practice guidance for LULUCF).

B. Recommendations

118. The ERT identified the issues for improvement listed in table 9. All recommendations are for the next annual submission, unless otherwise specified.

Table 9
Recommendations identified by the expert review team.

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
Cross-cutting	QA/QC	Describe in the NIR any changes in the QA/QC procedures	No	13

Sector	*Category cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
		Provide a short summary of the pre-submission review outcome in the NIR	No	14
	Transparency	Improve the transparency of the NIR by including sufficient information in the annual submission (e.g. based on the supporting material provided during the review)	No	15
	Inventory preparation	Perform a key category analysis following the IPCC good practice guidance at an aggregation level where individual methodologies and EFs are used	Yes	18
		Improve the inventory preparation in terms of prioritizing inventory improvements using the key category analysis	No	19
Energy	Overview	Complete the improvements regarding the use of comparable units	Yes	28
	Comparison of the reference approach with the sectoral approach and international statistics	Include a summary of information on the possible sources of differences between the approaches for liquid and solid fuels in the NIR	No	31
		Investigate the possibility of using disaggregated coal data in the reference approach	No	32
		Implement checks to ensure that all imports of coke oven/gas coke are correctly accounted for	No	32
		Review the EFs used in the reference approach	No	32
		Apply the relevant IPCC defaults for the fractions of carbon oxidized	No	33
	Feedstocks and non-energy use of fuels	Include the carbon content of emissions in the industrial processes sector in the amount of carbon stored in non-energy use of fuels reported in the energy sector in column E of CRF table1.A(d)	No	36
	Stationary combustion: solid, liquid and gaseous fuels – CO_2 CH_4 and N_2O	Implement planned improvements to avoid errors in future CRF tables	No	37
		Provide in the NIR an update on the status of QA/QC improvements	No	37
		Improve the text of the relevant sections of the NIR to better explain the reasons for the low EFs, and justify the extrapolation of these EFs over the	No	38

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
		entire time series		
		Improve the documentation of country-specific EFs and oxidation factors, including any corrections done, in the NIR	No	39
		Clearly document in the NIR any revision of the EFs to discount carbon unoxidized	No	39
	Road transportation: liquid fuels – CO_2	Review the report on carbon factors in detail and investigate whether the EFs that are currently used are accurate	No	43
		Report the findings of the review in the NIR	No	43
	Oil and natural gas: natural gas – CH_4	Improve the transparency of the description in the NIR of the methodology followed for the estimation of fugitive emissions from natural gas transmission and distribution systems	Yes	44
		Complete the update of estimates of the length of pipelines and report the findings	No	45
	Railways: solid fuels – CO_2, CH_4 and N_2O	Improve the time-series consistency of the estimates and consider reallocating the relevant emissions from "other industrial combustion" to railways	No	47
		Use the correct notation key in the CRF tables	No	47
	Coal mining and handling: solid fuels – CH_4	Revise the comment on the use of the notation key "IE" in CRF table 1.B.1	Yes	48
Industrial processes and solvent and other product use	Overview	Improve the consistency between what is reported in the NIR and the CRF tables focusing on the numerical descriptions of GHG emissions, including the impact of recalculations, and improve the consistency in the use of units in the NIR tables	No	51
		Conduct the key category analysis for F-gases at the subcategory level (e.g. HFCs from refrigeration and air-conditioning equipment)	No	52
	Nitric acid production – N_2O	Include in the NIR information on the monitoring standards followed by plant operators	No	53
		Include the reason for the change in the N_2O IEF, together with information on specific abatement measures taken at the two nitric acid production sites in its NIR	No	53
	Consumption of halocarbons and SF_6 – HFCs,	Incorporate in the NIR information on F-gas regulations and their coverage, and how collection/destruction is accounted for in the	No	54

Sector	*Category/ cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
	PFCs and SF_6	models to estimate emissions from consumption of halocarbons and SF_6		
		Continue to refine the underlying assumptions and methodologies of the models used, together with conducting checks of the consistency of reported AD	No	55
		Provide more specific explanation of how it has determined the EF(s) for foam blowing and indicate more consistently whether or not the emissions from manufacturing, stocks and disposal are reported separately, or provide clear reasons for why these emissions are aggregated when reporting	No	56
		Improve QC procedures to ensure consistent reporting between the NIR and the CRF tables prior to submission, but in particular to ensure the provision of correct information in the tables of the NIR regarding emissions	No	57
	Ammonia production – CO_2	Improve the consistency of its description of issues in the NIR, especially regarding quantitative data, and focus on the consistent use of units	No	60
Agriculture	Overview	Enhance QC procedures so that what is reported in the NIR and CRF tables is fully consistent, but especially with regard to values for emission estimates	No	64
	Enteric fermentation – CH_4	Implement the planned improvement of DE data through the commissioned research projects as explained	No	65
		Apply a methodology that more closely reflects the country-specific conditions, for instance, by moving to the IPCC tier 2 methodology for the sheep subcategory, in addition to documenting national circumstances leading to methodological choice	No	66
	Manure management – N_2O	Include information on the country-specific methodology for dairy cattle in the form of a summary explanation of how the nitrogen excretion values used in the inventory were derived	No	67
LULUCF	Overview	Incorporate an explanation on changes made since the previous NIR regarding areas allocated to land-use categories in 1990, as reported in the land-use matrix (NIR table 7.1)	No	73
	Forest land – CO_2	Continue efforts to gather information on the management of privately owned forests and include information on the management	No	76

Sector	*Category cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
		prescriptions and rotation ranges in the NIR		
		Continue efforts to improve the estimates on soil carbon and related documentation	No	77
	Cropland and grassland – CO_2	Research again the possibility of generating suitable data and report on the progress to estimate emissions and removals from organic soil, and until additional information becomes available, report using the notation key "NE"	No	80
		Assign orchards to cropland and provide documentation on the method used to estimate the carbon stock changes over time, and ensure that changes in the area of orchards over time have been taken into account	Yes	81
		Report land-use changes from cropland to grassland for 2010 onward	No	82
	Land converted to settlements – CO_2	Investigate the internal consistency of the reported changes in carbon stock and more transparently provide information on the methods used	Yes	83
	Wetlands	Assess the appropriateness of the use of the notation key "NE" for the carbon stock changes in living biomass in overseas territories for forest land converted to wetlands and the related area and report on it	No	84
Waste	Overview	Improve the QC checks in, and between, the main text of the NIR and the annexes, as well as with the CRF tables	Yes	87
	Solid waste disposal on land – CH_4	Implement the proposed improvements of emission estimates from solid waste disposal sites in the overseas territories and crown dependencies, by providing further information on methodologies to estimate emissions, and by completing the CRF tables with specific parameters such as AD, MCF and DOC	No	91
	Wastewater handling – CH_4	Improve the transparency of the employed EFs by providing a more detailed explanation in the NIR	Yes	92
	Waste incineration – CO_2, CH_4 and N_2O	Improve the documentation in the NIR, provide a detailed explanation of the methodology used to estimate emissions from accidental fires (vehicle) and standardize the terminology used for waste classification	No	93
KP-LULUCF	Deforestation – CO_2	Include the explanation that liming on deforested land occurs only in England	Yes	101
	Forest management – CO_2	Incorporate information on the effect of "windblow" disturbances in its next annual submission	Yes	103

Sector	*Category cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
Article 3, paragraph 14, of the Kyoto Protocol		Explicitly report any change(s) in the information provided under Article 3, paragraph 14	Yes	116

Abbreviations: AD = activity data, CRF = common reporting format, DOC = degradable organic carbon, DE = digestibility of feed, EF = emission factor, ERT = expert review team, F-gas = fluorinated gas, GHG = greenhouse gas, IE = included elsewhere, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, MCF = methane correction factor, NE = not estimated, NIR = national inventory report, QA/QC = quality assurance/quality control.

IV. Questions of implementation

119. No questions of implementation were identified by the ERT during the review.

Annex I

Information to be included in the compilation and accounting database

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2012, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	2 997 072 992 070 872 567	2 931 785 647		2 931 785 647
Annex A emissions for 2012				
CO_2	483 423 635			483 423 635
CH_4	50 759 204	52 784 108		52 784 108
N_2O	35 382 646	35 410 577		35 410 577
HFCs	13 988 672			13 988 672
PFCs	207 977			207 977
SF_6	542 161			542 161
Total Annex A sources[c]	**584 304 294**	**586 357 129**		**586 357 129**
Activities under Article 3, paragraph 3, for 2012				
3.3 Afforestation and reforestation on non-harvested land for 2012	–2 910 920			–2 910 920
3.3 Afforestation and reforestation on harvested land for 2012	IE			IE
3.3 Deforestation for 2012	1 079 637			1 079 637
Activities under Article 3, paragraph 4, for 2012[d]				
3.4 Forest management for 2012	–14 562 492			–14 562 492
3.4 Cropland management for 2012				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2012				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2012				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.
[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2011

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2011				
CO_2	464 036 071			464 036 071
CH_4	51 840 219	54 817 731		54 817 731
N_2O	35 682 543	35 709 481		35 709 481
HFCs	13 825 239			13 825 239
PFCs	325 347			325 347
SF_6	559 328			559 328
Total Annex A sources[c]	**566 268 747**	**569 273 197**		**569 273 197**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–2 766 143			–2 766 143
3.3 Afforestation and reforestation on harvested land for 2011	IE			IE
3.3 Deforestation for 2011	1 065 221			1 065 221
Activities under Article 3, paragraph 4, for 2011[d]				
3.4 Forest management for 2011	–15 088 551			–15 088 551
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	504 997 522			504 997 522
CH_4	52 656 088	56 698 023		56 698 023
N_2O	37 060 594	37 089 084		37 089 084
HFCs	13 564 869			13 564 869
PFCs	220 622			220 622
SF_6	647 772			647 772
Total Annex A sources[c]	**609 147 467**	**613 217 892**		**613 217 892**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–2 584 153			–2 584 153
3.3 Afforestation and reforestation on harvested land for 2010	IE			IE
3.3 Deforestation for 2010	1 066 165			1 066 165
Activities under Article 3, paragraph 4, for 2010[d]				
3.4 Forest management for 2010	–15 367 291			–15 367 291
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	487 442 442			487 442 442
CH_4	55 886 251	59 409 093		59 409 093
N_2O	36 162 092	36 189 297		36 189 297
HFCs	13 182 744			13 182 744
PFCs	145 032			145 032
SF_6	561 311			561 311
Total Annex A sources[c]	**593 379 872**	**596 929 919**		**596 929 919**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–2 395 861			–2 395 861
3.3 Afforestation and reforestation on harvested land for 2009	IE			IE
3.3 Deforestation for 2009	1 133 333			1 133 333
Activities under Article 3, paragraph 4, for 2009[d]				
3.4 Forest management for 2009	–15 525 592			–15 525 592
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	536 733 745			536 733 745
CH_4	58 117 623	62 805 299		62 805 299
N_2O	38 318 526	38 353 270		38 353 270
HFCs	12 777 280			12 777 280
PFCs	203 925			203 925
SF_6	584 903			584 903
Total Annex A sources[c]	**646 736 003**	**651 458 423**		**651 458 423**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–2 211 420			–2 211 420
3.3 Afforestation and reforestation on harvested land for 2008	IE			IE
3.3 Deforestation for 2008	1 098 146			1 098 146
Activities under Article 3, paragraph 4, for 2008[d]				
3.4 Forest management for 2008	–15 652 358			–15 652 358
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

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"Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for the United Kingdom of Great Britain and Northern Ireland 2014. Available at <http://unfccc.int/resource/docs/2014/asr/gbr.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2014. Available at <http://unfccc.int/resource/webdocs/sai/2014.pdf>.

FCCC/ARR/2013/GBR. Report of the individual review of the annual submission of the United Kingdom of Great Britain and Northern Ireland submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/gbr.pdf>.

Standard independent assessment report template, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Julia Sussams (UK Greenhouse Gas Statistics & Inventory, Department of Energy and Climate Change), including additional material on the methodology and assumptions used. The following documents[1] were also provided by the United Kingdom of Great Britain and Northern Ireland:

AEA Technology (2004). *Emissions and projections of HFCs, PFCs and SF_6 for the UK and constituent countries*, Final report prepared for the Department for Environment, Food and Rural Affairs, AEAT/ED50090/R02, 2nd edition June.

Apps, M.J., et al., ed. (1996). Forest ecosystems, forest management, and the global carbon cycle. Proceedings of the NATO advanced research workshop "The Role of Global Forest Ecosystems and Forest Resource Management in the Global Cycle" Chapter 19.

Bradley, R.I., et al., (2005). "*A soil carbon and land use database for the United Kingdom*", Soil Use and Management 21, pp.363–369.

DEFRA (2006). '*Nitrogen and phosphorus output of livestock excreta*' Final report of the project WT0715NVZ :Nitrogen and phosphorus output standards for farm livestock.

Hargreaves, K.J., et al., (2003) "*Carbon balance of afforested peatland in Scotland*", Forestry, Vol.76, No.3.

ICF International (2011). *Development of the GHG refrigeration and air conditioning model*, Final Report prepared for the Department of Energy and Climate Change.

Lockyer, D. R. & Jarvis, S. C. (1995). "*The measurement of methane losses from grazing Animals*", Environmental Pollution. Vol. 90, No. 3, pp. 383-390.

Matthews, R.(2014). *Changes to the representation of Forest Land and associated land-use changes in the 1990-2012 UK Greenhouse Gas Inventory*, prepared by Center for Ecology & Hydrology and Forest Research, for Department of Energy and Climate Change under Contract GA0510.

Matthews, R.W., (1992). "*Towards a methodology for the evaluation of the carbon budget of forests*", Carbon balance of world's forested ecosystems: towards a global assessment, proceedings of the IPCC AFOS workshop held in Joensuu, Finland, 11–15 May 1992 (Kanninen, M. ed.), pp.105–114.

Sneath, R.W., et al (1997). *A UK inventory of methane emissions from farmed livestock*.

Wheeler, K., et al (2012). *More robust evidence on the average age of UK lambs at slaughter*, ADAS.

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AD	activity data
BKB	brown coal briquettes
C	confidential
CDs	crown dependencies
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOC	degradable organic carbon
DE	digestibility of feed
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
ha	hectare
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kt	kilotonne
LULUCF	land use, land-use change and forestry
MCF	methane correction factor
MDI	metered dosed inhaler
Mt	million tonnes
Mth	mega therms
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
Nex	nitrogen excretion
NH_3	ammonia
NIR	national inventory report
NO	not occurring
NO_X	nitrogen oxide
OT	overseas territories
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)

QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SWDS	solid waste disposal sites
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change